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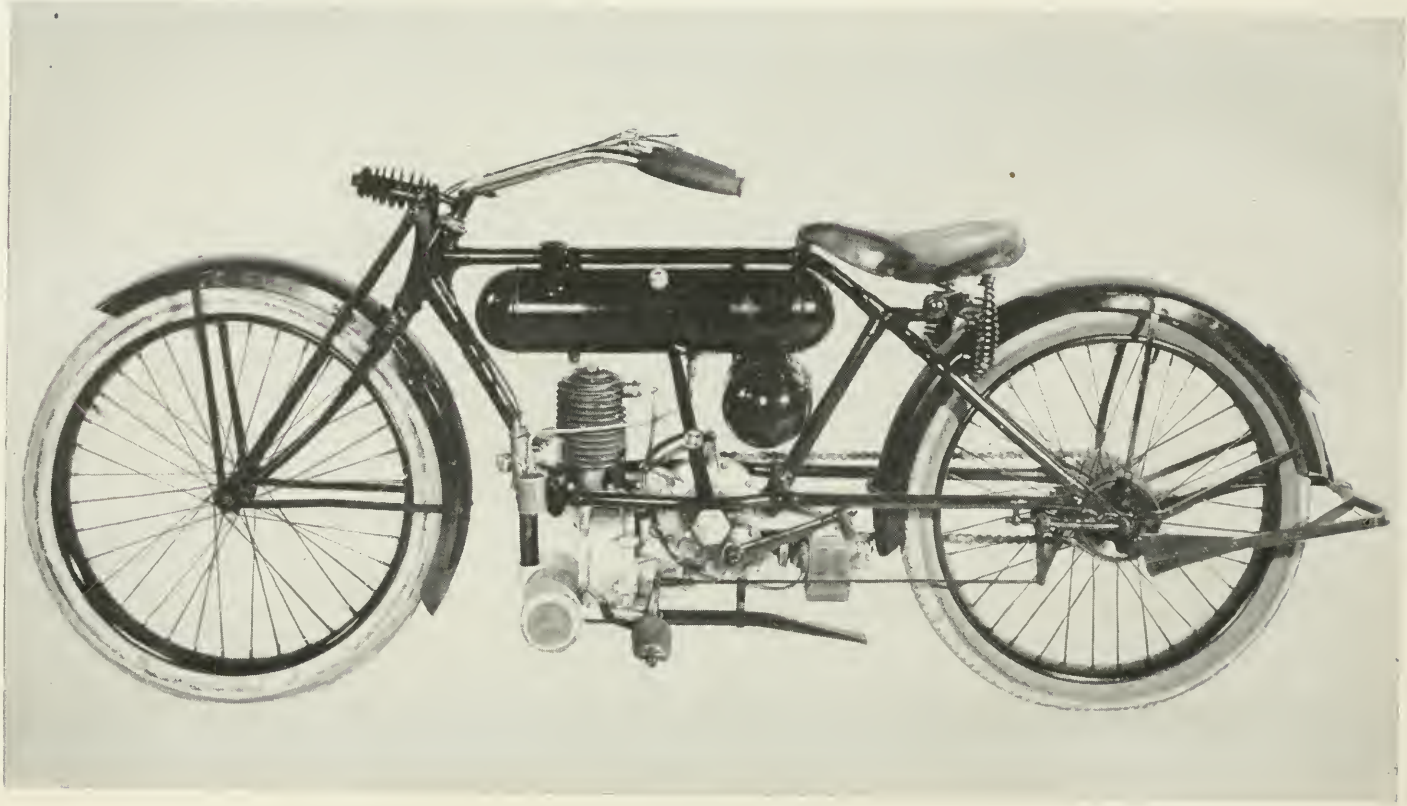

Cleveland motorcycle, 1918.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
BULLETIN 204

CATALOG OF THE CYCLE COLLECTION OF THE DIVISION OF ENGINEERING UNITED STATES NATIONAL MUSEUM

BY
SMITH HEMPSTONE OLIVER

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The present work forms No. 204 of the *Bulletin* series.

Remington Kellogg,
Director, United States National Museum.

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CATALOG OF THE CYCLE COLLECTION OF THE DIVISION OF ENGINEERING, UNITED STATES NATIONAL MUSEUM

By Smith Hempstone Oliver

INTRODUCTION

The bicycle, perhaps the most widely known form of mechanical transportation in the world today, has been with us for approximately a century and a half, and today is used for transportation, recreation, and business in nearly every part of the world. To the American as he first sets foot in Europe this widespread use is startling. Accustomed at home to seeing the automobile completely outnumber the bicycle, he finds the streets in foreign cities teeming with bicycles as workers pedal between home and work in the early morning and late afternoon.

It is stated that a Frenchman, de Sivrac, constructed a crude form of bicycle in the latter part of the eighteenth century. Called a "célérifère," it consisted of a rough wooden bar supported on two wheels and carrying a padded saddle. The front fork had no swiveling action, so the vehicle could not be steered. It was propelled by the rider's striking his feet against the ground.

About 1816, Baron von Drais constructed a similar machine, the front wheel of which was mounted in a fork that could be swiveled, allowing the device to be steered. His machine, known as the "Draisienne" or the "Draisine," several years later was introduced into England by Denis Johnson, whose improved version had an adjustable saddle, a cushioned rest for the forearms, and a different arrangement of the handle bars. Known in England as the Pedestrian Curricle, the Hobby Horse, or the Dandy Horse, this form of vehicle was in vogue in 1818 and for several years afterward. Contemporary lithographs show dandies practicing on the machine in riding academies, as well as riding it over the open road (pl. 1). It, too, was propelled by the rider's striking his feet against the ground. A modern facsimile of such a machine is in the collection of the National Museum (pl. 7, *a*).

W. K. Clarkson, Jr., of New York, obtained a United States patent for a velocipede on June 26, 1819, but it is no longer known exactly

what he claimed, as the records were destroyed in the Patent Office fire of 1836.

In 1821, Gompertz in England designed a machine to be propelled by the motion of the rider's arms, which, by means of gearing, applied power to the front wheel (see pl. 2, *b*). About 1840, Kirkpatrick MacMillan, a Scottish blacksmith, fitted cranks to the rear-wheel axle of a velocipede, but did not carry the improvement any further.

In Paris shortly after 1860, either Pierre Michaux or his employee Pierre Lallement fitted pedals to the front-wheel axle of a velocipede, creating what became known in America and England as the "boneshaker." Later, Lallement took up residence in New Haven, Conn., and on November 20, 1866, obtained a patent (No. 59915) covering a similar machine, entitled "improvement in velocipedes." The patent drawing reveals a saddle attached to a spring mounted above the frame of the machine, as well as weighted, pivoting pedals.

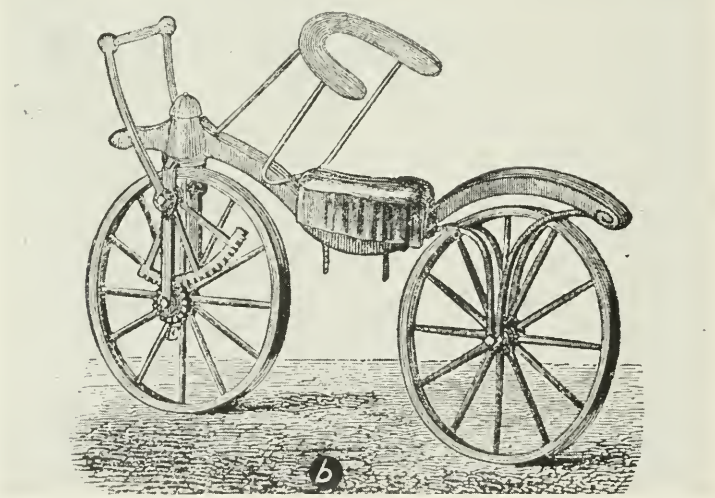
The Hanlon brothers of New York City obtained a patent (No. 79654) on July 7, 1868, for an improved version of the Lallement vehicle, their patent covering adjustable pedals and seat. In addition, they suggested that rubber rings could be used on the wheels to make them noiseless and to prevent their slipping. Here was an early use, suggested at least, of the rubber tire. Another Hanlon patent (No. 86834) granted February 9, 1869, covered a mudguard over the front wheel, and a brake shoe operating against a wheel and controlled by twisting the handle bars. Although these machines achieved temporary popularity both in America and abroad, this popularity soon waned because they were cumbersome, extremely heavy, and required an awkward angle of thrust on the pedals, as the rider sat far behind them.

At least one early inventor, S. H. Roper, of Roxbury, Mass., constructed a steam-operated velocipede, and his machine (pl. 4, *a*) appeared in the late 1860's at fairs and circuses in New England. Resembling a Hanlon-type velocipede, with wooden wheels and iron-band tires, the machine was propelled through the rear wheel, the axle of which was fitted with cranks connected to two small steam cylinders, one on each side of the rear section of the frame.

In the early 1870's, bicycles and tricycles using wire wheels made their appearance, notably in England. James Starley of Coventry was one of the pioneers in this field, and, until his death in 1881, fathered many new and ingenious features pertaining to cycling. Another English pioneer was H. J. Lawson, who built an experimental rear-chain-driven safety bicycle during this period.

The high-wheeled bicycle, with the saddle well forward over the large front wheel, was first produced in England and was introduced to America by English firms exhibiting at the Centennial Exposition at Philadelphia in 1876. This type, which became known as the ordi-

a, An 1819 aquatint by H. Alken, showing Johnson's Pedestrian Hobby Horse Riding School in London. Photograph No. 8885–A.
b, An aquatint of 1819 showing a Hobby Horse. Photograph No. 11041–A.



a, An old etching entitled "The Ladies' Hobby, 1819," showing a hand-and-foot-operated tricycle. Photograph No. 11041.

b, Hand-operated velocipede designed by Gompertz in England in 1821. Photograph No. 784–E.

nary, was the first really practical bicycle. The rider was in a position to add his weight to a downward thrust on the pedals, and, compared to earlier bicycles of the boneshaker type, it was a lightweight, comfortable machine. It was immediately popular, and the interest in bicycling increased greatly with its introduction.

At the close of the Exposition the unsold ordinaries were taken by the Baltimore firm of Timms and Lawford, and most of them were soon sold to the newly organized Cunningham Co., of Boston, Mass., which, in 1877, was the first bicycle importing firm in America. In the same year Albert A. Pope also began importing English bicycles, and in 1878 his company, the Pope Manufacturing Co., of Boston, Mass., became the first manufacturer of bicycles in America. In that year Pope began building bicycles under the trade name "Columbia" in the factory of the Weed Sewing Machine Co. at Hartford, Conn., and by 1895 all of his interests were concentrated in that city, including the offices formerly located in Boston.

In 1877 the first bicycle periodical in the United States, "The American Bicycling Journal," was started at Boston by Frank W. Weston, and 2 years later was merged with "The Bicycling World," also of Boston. As many of the early riders of bicycles in America were Bostonians, and since the first bicycle club in America was the Boston Bicycle Club, jointly founded on February 11, 1878, by Charles E. Pratt and Frank W. Weston, Boston soon became the center of bicycling in this country.

The ordinary, or high-wheeled bicycle with the large wheel in front, was especially hazardous, as the rider was in danger of taking what came to be called a "header" whenever the front wheel struck an obstruction in the road. To circumvent this problem, a bicycle with the large wheel in the rear was devised. Generally known as a Star, its popularity never approached that of the ordinary.

In 1884 or 1885 Lucius D. Copeland equipped one of these Stars with a small steam engine and a boiler, and successfully operated the machine. Two or three years later a tricycle (pl. 4, *b*) was similarly equipped for Copeland by the Northrop Manufacturing Co., of Camden, N. J. Articles on these machines appeared in many engineering magazines of that time, and Sandford Northrop issued advertising brochures publicizing the formation of his Moto-cycle Manufacturing Co., but the venture proceeded no further. It was, nevertheless, another one of the many pioneer attempts in America to produce a commercially successful self-propelled vehicle.

Although usually thought of as early automobiles, the original vehicles of the German inventors Gottlieb Daimler and Karl Benz are a part of the history of cycle development. Each produced, independently of the other, a gasoline-engine-powered cycle in 1885.

Daimler's was a two-wheeled vehicle—a motorcycle—while Benz's machine was a large tricycle with wire-spoked wheels, the single front one being the steerable wheel.

The high-wheeled ordinary and the Star bicycles were succeeded by the so-called safety, pioneered by J. K. Starley, nephew of James Starley, and by Lawson, to eliminate the danger, inherent in the ordinary, of the rider taking a header over the high front wheel. Gradually the size of the high wheel was reduced until, by the middle 1880's, the proportions of the modern safety had been achieved. Curiously, this was a return, after many years of evolution, to the proportions of the old Hobby Horse which also had two wheels of equal size. However, the safeties were driven by chain or shaft to the rear wheel from pedals located well below the rider. Most of those produced at the turn of the century were chain driven. A contemporary description of a typical bicycle of this period can be seen in figure 1.

Prior to 1898, bicycles had appeared with braking mechanisms associated with the driving systems, but these did not include coasting or free-wheeling features. The idea of a coaster brake for bicycles appeared in the patent applications of Harry P. Townsend, of the New Departure Manufacturing Co., Bristol, Conn., in 1898; James S. Copeland, of the Pope Manufacturing Co., also in 1898; and William Robinson, of Brooklyn, N. Y., in 1899. These issued as patents, respectively, in 1907, 1913, and 1903. It is stated that the Townsend patent, No. 850077, contained the broad and controlling claims. The 1898 catalog of the Pope Manufacturing Co. describes the Columbia New Departure automatic brake, first used by them in that year, as a device for which a need had long existed. There is no doubt that the widespread adoption of the coaster brake made the bicycle a much safer vehicle to ride.

In the 1890's interest in bicycling reached boom proportions. Production of bicycles rose from an estimated 200,000 in 1889 to 1,000,000 in 1899, and the machine attained an importance it has not held in America since. On a population basis the 2,000,000 bicycles produced in 1950 is roughly equivalent to the 1,000,000 of 1899, but the importance of the bicycle to the life of the 1890's was much greater than it is to life today. Then, only a few score automobiles had been built, horses and carriages were expensive to maintain in crowded cities, and urban public transportation was, with few exceptions, slow and frequently inadequate. The bicycle met the need for inexpensive individual transportation—much as the automobile does today—for going to and from business, for business deliveries, for recreational riding, and for sport.

What to moderns seems a simple device of modest and limited performance was, in the relatively unmechanized 1890's, a swift vehicle and a fine machine. Owners were drawn together by their interest

a, Lallement velocipede of 1866. Photograph No. 784–G.
b, Star bicycle of the 1880's. Photograph No. 784–H.

a, Steam-operated velocipede constructed by S. H. Roper in the late 1860's. Photograph No. 36684.

b, Photo taken about 1888 showing the Copeland steam-operated tricycle outside the Smithsonian Institution. Photograph No. 5125.

in it as a mechanism, as well as in riding or racing, and bicycle clubs were a part of the social and sporting scene.

A nation-wide bicycle club, the League of American Wheelmen, was formed on May 30, 1880, at Newport, R. I., through the joint efforts of Kirk Munroe, of New York, and Charles Pratt. Membership went above 100,000, and the influence of its numbers was an effective promoter of good roads.

Bicycle racing as an international sport 50 years ago had a large and enthusiastic following in the United States, and the demand for lighter and faster bicycles accelerated many of the improvements made by the manufacturers. The successful racers were the sports heroes of the day. Charles M. Murphy was one who attained lasting fame by an amazing performance. On June 30, 1899, on a board surface laid between the rails of the Long Island Railroad, Murphy, riding within a hood built at the rear of a car, kept up with the car as it was pulled by a locomotive at a little faster than 60 miles an hour. For this feat he became known as "Mile-A-Minute Murphy." His record was surpassed on May 17, 1941, when Alfred Letourner pedaled a mile in 33.05 seconds on a highway in California, travelling at the rate of 108.92 miles an hour in the wake of a shield attached to the rear of a midget racing automobile.

Directly and indirectly the bicycle had a decided influence on the introduction and ready acceptance of the automobile. The bicycle introduced thousands of persons to individual mechanical transportation, and proved the value of many materials and parts that were subsequently taken over by the automobile designers. Ball bearings found one of their earliest uses in bicycles of 1880 or earlier. The differential unit was employed in tricycles, and various forms of freewheeling and gear-shifting devices were in use. Steel tubing, developed largely for cycle frame construction, was adopted by some early automobile builders. Pneumatic tires for cycles were patented (No. 435995) in the United States on September 9, 1890, by John Boyd Dunlop, a veterinarian of Belfast, Ireland, and were actually in use on bicycles prior to that time. That was before the gasoline automobile came to America.

Many pioneer automobile builders were at first bicycle manufacturers. Among these were Charles E. Duryea, Alexander Winton, Colonel Albert A. Pope, H. A. Lozier, and George N. Pierce, all of whom manufactured automobiles bearing their names. Furthermore, Wilbur and Orville Wright were bicycle manufacturers in Dayton, Ohio, before they turned their attention to the aeronautical field, and Glenn H. Curtiss, another aviation pioneer, started out as a bicycle manufacturer.

Many well-known bicycle racers of the early days ultimately became

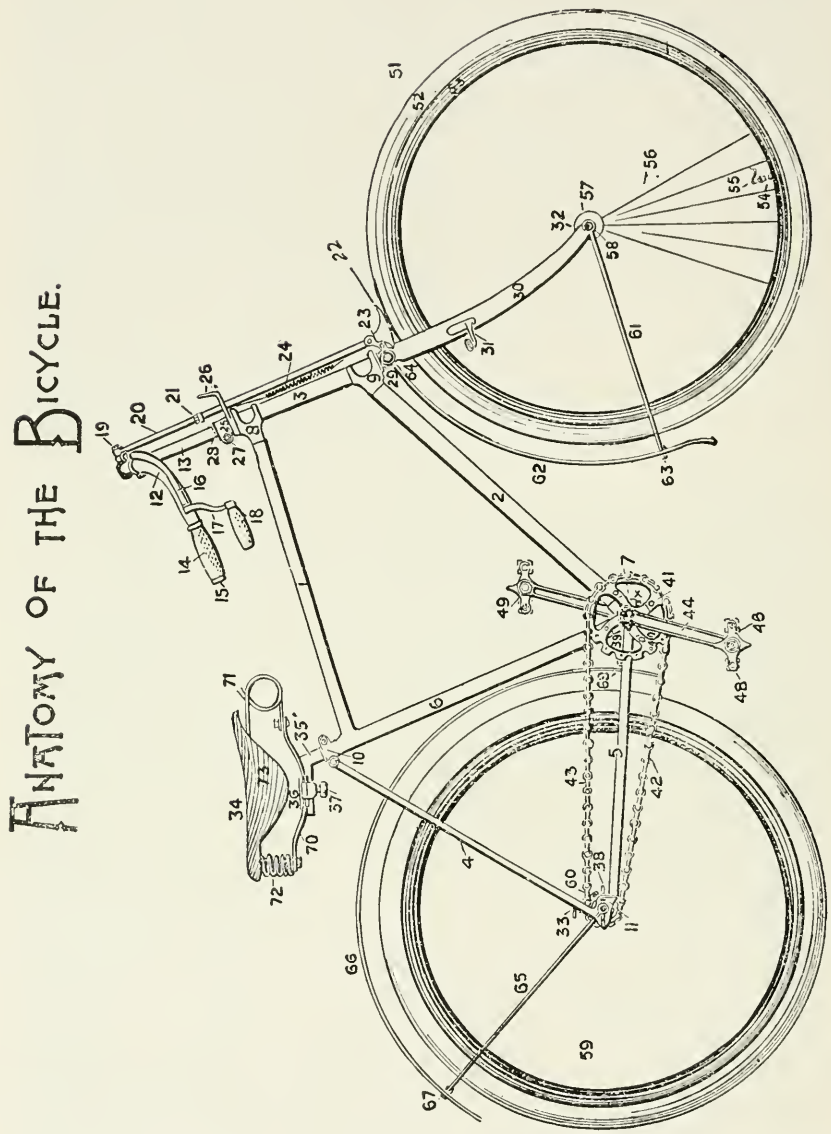

ANATOMY OF THE BICYCLE.

FIGURE 1.—The following caption accompanied this illustration, which appeared in a newspaper some time after the introduction of the modern safety:

This description applies to an ordinary diamond frame wheel. There are many extra attachments, and different makers have different ways of putting a wheel together, so that they may differ in one or two minor details. The description given, however, is in the main correct. It includes mud-guards and their fittings, which are used but little here, but are on all wheels made in England. They are used generally on drop-frame wheels in this country.

1. Upper main tube.
2. Lower main tube.
3. Front frame tube.
4. Back stays.
5. Back forks.
6. Centre stay.
7. Crank bracket. Contains cones at outer ends, crank axle, with ball-bearings and adjustment clip bolt.
8. Upper ball head race, or cup.
9. Lower ball head race, or cup.
10. Saddle post adjustment clip.
11. Back fork end.
12. Handle-bar.
13. Handle-bar stem.
14. Handle.
15. Ferrule, or nickel tip.
16. Brake lever.
17. Brake lever crank.
18. Brake lever handle.
19. Brake plunger connecting bolt.
20. Brake plunger.
21. Brake plunger adjustment nut.
22. Brake shoe.
23. Brake shackles, bolts and nuts.
24. Brake spring.
25. Handle-bar clip and ball head cone.
26. Lamp bracket.
27. Lock nut for handle-bar clip.
28. Ball head adjusting nut.
29. Front fork crown, with brake lug in front.
30. Fork sides, right and left.
31. Coasters.
32. Fork ends.
33. Step.
34. Saddle.
35. Saddle post.
36. Saddle clip.
37. Set screw.
38. Chain adjustment bolt.
39. Crank axle.
40. Detachable sprocket wheel.
41. Sprocket bolts.
42. Chain.
43. Detachable link in chain.
44. Crank.
45. Cotter pin nut and washer for detachable crank on other side of machine.
46. Pedal.
48. Pedal pin.
49. Nut and washer.
51. Steering wheel.
52. Tire.
53. Rim.
54. Air valve.
55. Valve cap.
56. Spokes.
57. Hub, which comprises outside shell with bushes, axle, and ball bearings.
58. Washers for fixing to forks.
59. Driving wheel.
60. Driving wheel hub.
61. Front mud-guard stays.
62. Front mud-guard.
63–4. Front mud-guard screws.
65. Back mud-guard stays.
66. Back mud-guard.
67. Back mud-guard screws.
69. Back mud-guard screws.
70. Saddle frame.
71. Front saddle spring.
72. Rear saddle spring.
73. Leather top, with tension adjustment screw in front, underneath.

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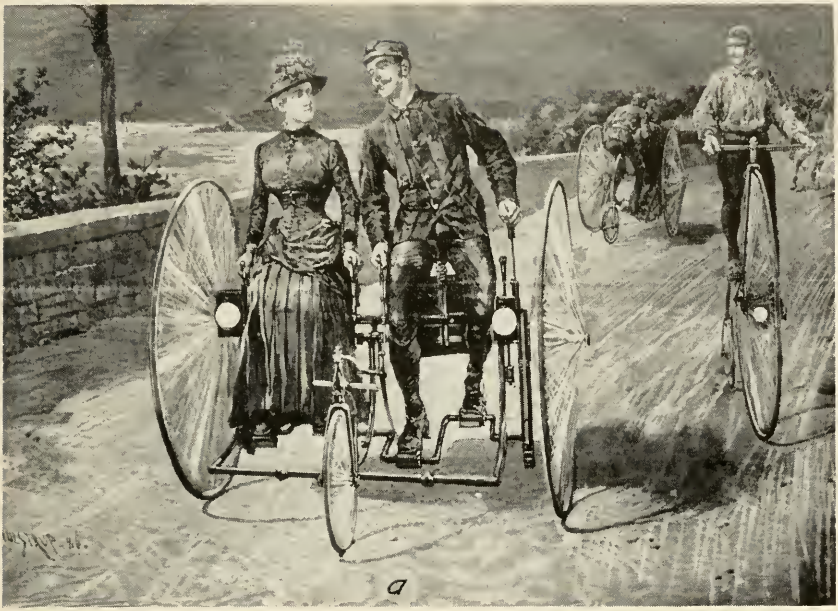
famous in the automobile racing field, Ralph De Palma probably being the best known of the converts.

Lastly, the improvement in highways and street paving promoted by organized bicyclists, though primitive by our standards, was an important element in the acceptance of the early automobile. It can truly be said that the cycle was the proving ground for the automobile.

As the twentieth century progressed, cycling lost its popularity to other forms of transportation and sport in America. Many manufacturers of bicycles failed and shut their doors, but a few managed to weather the storm. When cycling ultimately regained some of its past distinction, these makers were available to carry on the trade. In recent years, changes in design that have helped to restore interest in bicycles in this country have included such improvements as better tires, brakes, lights, suspension systems, and locking facilities.

During World War II, the bicycle was used by ever-increasing numbers of workers in war plants, a necessity created by the shortage of automobiles, and the rationing of tires and gasoline. Many of these cyclists remember with favor the advantages of the bicycle over the automobile, especially for short-distance runs, and have held on to their 2-wheeled machines. Today, modern safety bicycles, be they diamond, drop, or tandem frame, are seen in increasing numbers. Children ride them to and from school and playgrounds, stores use them for making deliveries, and a greater number of adults use them for transportation as well as for sport.

New clubs and rental agencies for bicycles have sprung up over the country. This increased interest has been so great that the 15 cycle manufacturers in the United States produced approximately 2 million bicycles in 1950, and statistics show that there are 18 million in use in America today. It appears that the bicycle will continue as an important factor in our economy and our everyday life for years to come.



a, Wood-engraving "Wheeling on Riverside Drive," appearing in Harper's Weekly, July 17, 1886. Photograph No. 31589.

b, Early bicycle club group lined up on the road outside Readville, Mass., Sept. 11, 1879. Photograph No. 38370.

a, M. W. Wright, famous English bicycle racer of the 1870's, with his Arab ordinary. Photograph No. 33184.
b, Medals of the type given in the 1890's for bicycle racing. Photograph No. 37603.

VELOCIPEDE, Ca. 1818

U. S. N. M. No. 308263; modern facsimile; gift of Buster Keaton in 1924; photograph No. 797½–D; plate 7, *a*.

This reproduction of the Pedestrian Curricle, or Hobby Horse, popularized in England in 1818 by Denis Johnson, was used about 1924 in the motion picture "Our Hospitality."

A wooden bar, 55 inches long, and curved downwards slightly in the center, supports by means of iron braces a wheel in the rear. A vertical iron fork, supporting another wheel, is pivoted at the front of the bar. The fork is steered by means of a curved tongue attached to the bottom of the fork. A wooden armrest for the rider is mounted upon iron braces at the front of the bar. A felt saddle is carried on the center of the bar.

Each wheel is 30 inches in diameter and contains eight spokes. The spokes, hubs, and felloes are of wood, with the spokes staggered in the hubs. Narrow iron tires are fitted to the felloes.

VELOCIPEDE, Ca. 1867

U. S. N. M. No. 181311; original; gift of William R. Beisel in 1894; photograph No. 811–A; plate 7, *b*.

The maker of this velocipede is not known. It is stamped "J. N. Hazelip," a name thought to be probably that of the owner. No date appears on the machine, which is of the Lallement type.

A forged-iron frame supports a forged-iron fork pivoting at the front of the frame. The top of the fork is fitted with curved iron handle bars that undoubtedly were originally fitted with wooden grips, now missing.

The wheels of the vehicle are of wood, each with 12 spokes slightly staggered in the hub. The tires are thin metal bands. The diameter of the front wheel is 41¼ inches and of the rear, 36 inches. On the front axle, wooden, spool-shaped pedals are fitted to nonadjustable cranks having a throw of 6½ inches.

A thin metal saddle, originally probably covered with leather or felt, is suspended on a broad, curved, single-leaf, metal spring directly over the center of the frame.

VELOCIPEDE, Ca. 1868

U. S. N. M. No. 247884; original; gift of William Sturgis Bigelow in 1907; photograph No. 797½–B; plate 8, *a*.

The donor of this machine, which is of the Hanlon type, stated that it was made by either Sargent or French, carriage builders of Boston, Mass., about 1868, and that it sold for $160. An almost

identical machine is pictured on page 22 of "The American Bicycler," by Charles E. Pratt, published in Boston in 1880. The illustration shows an "American velocipede of 1869." Another similar machine is pictured on page 28 of "Cycles and Cycling," by H. Hewitt Griffin, published in New York in 1890. The illustration shows an "Improved Boneshaker of 1870," made by Charles Pomeroy Button, of 142 Cheapside, London. This date was near the end of the era of this type of machine, as the high-wheelers were soon to replace the heavy velocipedes.

A heavy forged bar, terminating in a fork at its lower end, serves as a frame. A vertical iron fork, topped by a horizontal handle bar mounted in brackets, is pivoted at the front of the frame. Wooden-spoked wheels, tired with iron bands, are mounted in the forks. The front wheel is 37 inches in diameter and contains 16 spokes, while the rear is 31½ inches in diameter and contains 14 spokes. The spokes are staggered in the wooden hubs. Cranks with adjustable, weighted pedals are attached to the live axle of the front wheel. The adjustment allows for a throw of from 4½ to 7 inches.

Twisting the handle bars in the mounting brackets causes a chain to pivot a metal shoe in the frame. The shoe acts as a brake on the tire of the rear wheel. A leather saddle is mounted on a flat metal spring above the center of the machine.

VAN ANDEN "DEXTER" VELOCIPEDE, 1869

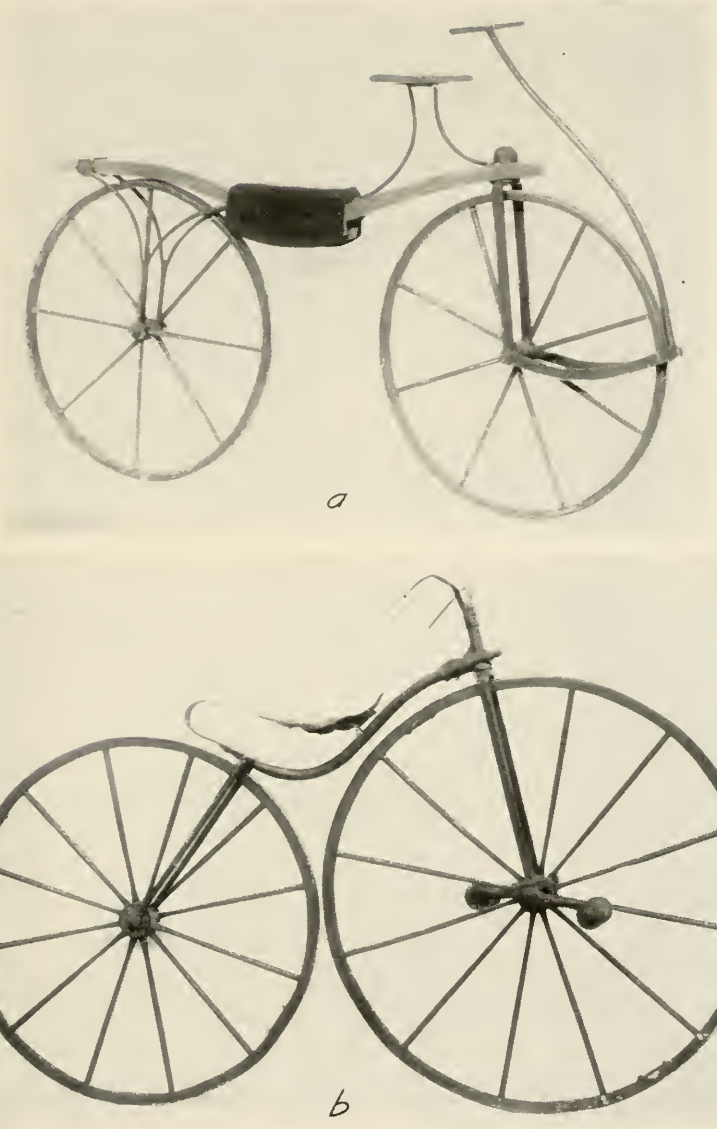
U. S. N. M. No. 310206; original; gift of Mrs. William M. Van Anden in 1930; photograph No. 38609–A; plate 8, *b*.

William Van Anden, of Poughkeepsie, N. Y., was granted patent No. 88238 on March 23, 1869, covering "improvement in velocipedes." This improvement consisted of a "ratchet device" or free-wheeling unit in the hub of the front wheel, enabling the rider's feet to remain motionless while the velocipede continued to move by momentum as a coaster-brake-equipped bicycle will do.

This velocipede, built by Van Anden, contains the above feature. A clipping from the Brooklyn Daily Eagle of February 20, 1869, describes the velocipede and mentions that it had been on exhibition the previous week at Burnham's velocipede school.

The frame and fork are of iron, and are supported on wooden wheels with staggered spokes and iron tires. The front wheel is 36¼ inches in diameter and is mounted in the fork, which pivots at the front of the frame. Spool-shaped pedals are secured to the driving pawls within the hub. The rear wheel is 32¼ inches in diameter.

The handle bars twist to actuate a linkage connected to a friction brake operating against the tire of the rear wheel. A drilled cast-iron



a, Velocipede, ca. 1818. (Modern facsimile.)
b, Velocipede, ca. 1867.

a, Velocipede, ca. 1868.
b, Van Anden "Dexter" velocipede, 1869.

saddle (not original) is mounted on leather straps attached to curved iron supports in the center of the frame.

This is an early example of a bicycle having wheels nearly equal in size. It is exceptionally heavy, weighing approximately 55 pounds, and therefore difficult to ride and handle, but the inventor's use of the overrunning clutch was well ahead of the times.

GREENE AND DYER MONOCYCLE, 1869

U. S. N. M. No. 312832; original; gift of W. Easton Louttit, Jr., in 1944; photograph No. 41054; plate 9.

Allen Greene and Elisha Dyer, of Providence, R. I., were granted patent No. 91535 on June 22, 1869, for an "improvement in velocipede." This incomplete monocycle, built by them, represents their invention. The donor states that it is reported that the vehicle crashed badly on its first trial run, and proved to be unsatisfactory.

The 24 spokes and the felloe are of wood, while a thin metal band attached to the felloe serves as a tire. The diameter of the wheel is 8 feet and its thickness at the hub, 4 feet. The bowed spokes radiating in from the rim are alternately connected to each side of the wheel hub. Each of these sides is composed of two metal discs bolted together, with 12 of the spokes clamped between each pair of discs.

Within the center of the wheel a framework is suspended from short shafts extending inwards from the two sides of the hub. A swinging seat for the operator is attached to the framework. Small hand cranks are also attached to the framework near the short shaft extensions, but how they worked is not clear. The patent specifications refer to hand cranks and foot treadles jointly providing the motive power, but no treadles exist now, and the cranks are inoperative. No other parts of the mechanism remain, and it is doubtful if the vehicle ever was completed.

CHILD'S TRICYCLE VELOCIPEDE, 1876

U. S. N. M. No. 309803; original; gift of Mrs. Harold Allen in 1930; photograph No. 5400–A; plate 10, *a*.

Patent No. 171623 was issued on December 28, 1875, to George W. Marble, of Chicago, Ill., for an "improvement in velocipedes." One half his right was assigned to Adolph Shoeninger, also of Chicago. This small tricycle, constructed principally of wood, bears the above patent date, and is similar to the drawing accompanying the patent application.

Two wooden bars form the sloping frame, and two others form the fork which pivots at the front of the frame. Metal fittings at each end of each rod serve as pivots for the fork, and as bearings for the

wheels. Straight wooden handle bars, and a cast-iron saddle are provided.

The hubs, spokes, and felloes of the three wheels are of wood. The tires are thin metal rims. The front wheel has a diameter of 24 inches, while the rear wheels are 20 inches in diameter. Spool-shaped wooden pedals are attached to the crank arms of the front wheel. The distance between the two rear wheels is 11 inches.

UNZICKER TRICYCLE, 1878

U. S. N. M. No. 309256; original Patent Office model; transferred from the U. S. Patent Office; photograph No. 784–B; plate 10, *b*.

Patent No. 204636 was issued on June 4, 1878, to Otto Unzicker, of Chicago, Ill., for an "improvement in velocipedes." This model shows a tricycle propelled by the back-and-forth motion of the wooden handle bars. The bars, which also steer the tricycle, are fastened to the upright arm of a bell-crank attached to the top of the fork. Motion of the bell-crank is transmitted by connecting rods to cranks on the ends of the front-wheel axle.

The model, measuring 11 inches long, 7½ inches high, and 3½ inches wide, is constructed of wood and brass, except for the steel rear axle and the leather strap for the single stirrup. The sloping frame and the fork are of wood, with fittings connecting the two. The wheels are of wood, the 5-inch diameter front one containing 12 spokes, and the 4½-inch diameter rear ones each containing 10 spokes. The spokes are staggered in the wooden hubs.

The sidesaddle places the rider on the left side of the vehicle. Because of the mechanical disadvantage accompanying this method of propulsion, and the relatively narrow track of the rear wheels, it is thought that a full-sized vehicle would not have proven very satisfactory on the poor roads of the nineteenth century.

It is interesting to note the similarity in design of the main components of this tricycle and those of the 1876 child's tricycle velocipede in the collection. Some connection between the two may well have existed, as Unzicker's patent was assigned in its entirety to the same Adolph Shoeninger associated with Marble.

SHIRE VELOCIPEDE, 1879

U. S. N. M. No. 248087; original; gift of C. Howard Buckler in 1907; photograph No. 30650–D; plate 11, *a*.

Built at a rather late date for this type of vehicle, this "boneshaker" bears a brass plate marked "J. Shire, Patent allowed May 10, 1879, Detroit, Mich." Patent Office records reveal the fact that John

Greene and Dyer monocycle, 1869.

a, Child's tricycle velocipede, 1876.
b, Unzicker tricycle, 1878. (Patent Office model.)

Shire, of Detroit, Mich., was granted patent No. 216231 on June 3, 1879, covering "improvement in velocipedes." The Shire velocipede in the collection is similar to the drawing accompanying the patent application. No patents were granted to Shire on the date appearing on the plate attached to the machine. The high, wire-wheeled ordinary was already on the market by 1879, and for such a specimen as this crude machine to have been built at the same time seems anachronistic. It is interesting to note that it was built in the future capital of the automotive world.

The forked frame and the front-wheel fork are both made of wood with iron reinforcements. The front-wheel fork pivots at the front of the frame, straight wooden handle bars surmounting it. The upper end of a nearly vertical wooden brace also serves as a pivot point for the front fork. The lower end of the brace is connected by iron bars to the lower extremity of the frame.

Both of the wheels have wooden hubs, spokes, and felloes, with thin metal tires. Each wheel has 14 spokes staggered in the hub. The diameter of the front wheel is 38 inches and of the rear, 28¾ inches. Wooden crank arms, having a 5-inch throw but not adjustable for their working length, are attached to the front axle. Spool-shaped wooden pedals are mounted at the ends of the arms.

Oil cups are mounted at each end of the two axles. A wide wooden mudguard is affixed above the rear wheel. The saddle is made of wood, canvas, and leather. There is no brake on the machine. In a few places gold and red ornamental striping is still visible.

FOWLER TRICYCLE, 1880

U. S. N. M. No. 309257; original Patent Office model; transferred from the U. S. Patent Office; photograph No. 784–D; plate 11, *b*.

Patent No. 224165 was issued on February 3, 1880, to Francis Fowler, of New Haven, Conn., for a tricycle equipped with a ratchet connection in the hub of each driving wheel. The purpose was to enable the outer of the two driving wheels to rotate freely on the crankshaft when the machine was making a sharp turn, thus performing the function of a modern automotive differential unit.

This model, measuring 11 inches long, 10 inches high, and 11 inches wide, is constructed of metal with the exception of wooden grips on the handle bars and leather straps on the pedals of the cranks on the front axle. The frame consists of a curved bar at the rear, upon which a saddle is located, and a vertical forked frame at the front pivoting in the steering head of the bar. At the top of the fork is a horizontal bracket supporting a rod which serves as the handle bars. This rod is free to be rotated within its supports in the bracket.

Rotating the rod tightens a cord running down the curved bar and causes a brake shoe to bear against the single rear wheel mounted at the lower end of the bar. This wheel is 2¾ inches in diameter and has eight spokes.

An axle is mounted at the bottom of the fork. On each end of the axle is a wheel 7¾ inches in diameter and having 10 spokes. The wheels are 8¾ inches apart. Cranks connect the axle and the wheel hubs.

Each front-wheel hub incorporates a pair of double-crown, ratchet gears held together by a spring in the hub. Forward movement of the axle drives the wheels, but when the cranking is halted and the axle is stationary the ratchets open and the wheels coast. Also, as stated before, the outer wheel slips when the machine is making a sharp turn. Each intermittent opening of the ratchets would cause the wheels to be forced slightly apart and would occasion considerable wear of the teeth, as well as a clicking noise, deficiencies not found in the Van Anden velocipede, with its pawl-and-ratchet device in the hub of the front wheel.

HAMMELMANN TRICYCLE, 1880

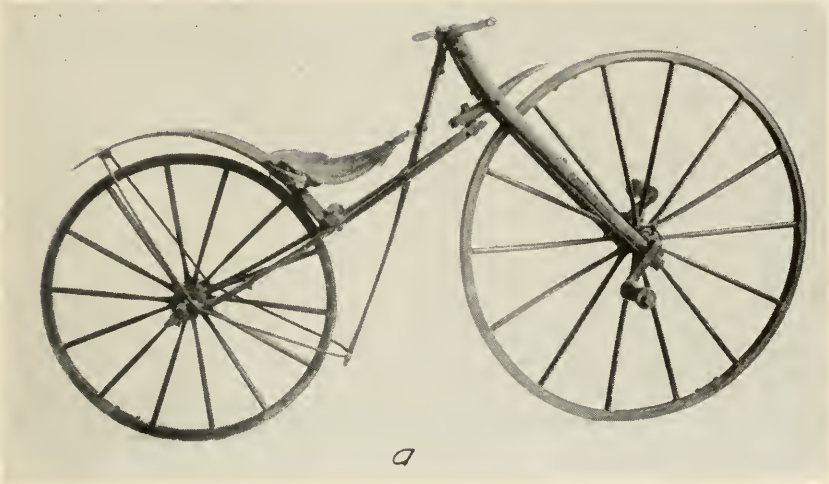
U. S. N. M. No. 309258; original Patent Office model; transferred from the U. S. Patent Office; photograph No. 784–A; plate 12, *a*.

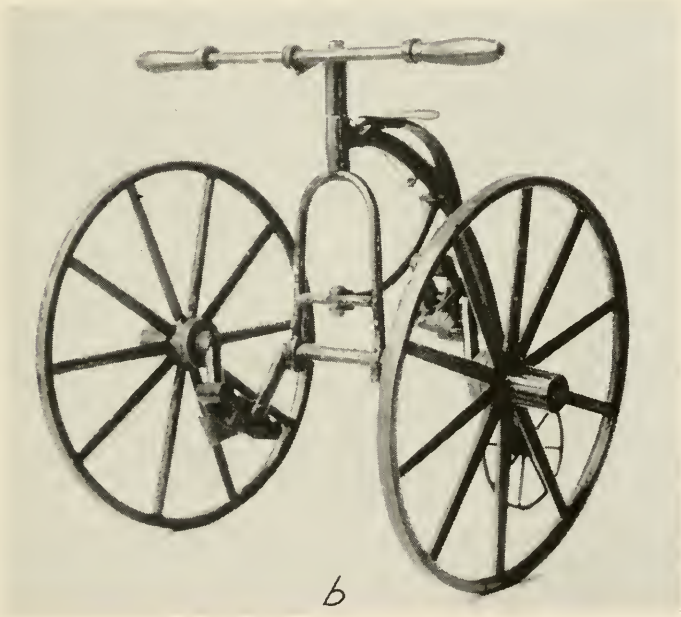
Patent No. 225010 was issued on March 2, 1880, to Charles Hammelmann, of Buffalo, N. Y., for a velocipede. This model shows a tricycle propelled by two foot-operated, spring-returned levers that rock sector racks meshed with ratchet gears on the front-wheel axle.

The model, measuring 8¾ inches long, 8½ inches high, and 4¾ inches wide, is constructed of metal, with the exception of the wooden saddle. The frame consists of a curved bar at the rear, terminating in a fork at its lower end, and a vertical fork at the front, this fork pivoting in the steering head of the bar. A saddle is attached to the curved bar by means of a spring. At the top of the front fork are the handle bars. An axle at the bottom of the rear fork mounts two wheels, each 2⅛ inches in diameter and having six spokes. The centers of the wide treads of these two wheels are 3¼ inches apart.

The front wheel is 6 inches in diameter and has 10 spokes. Its perimeter is grooved as if to mount a solid rubber tire, though it is not known if a tire was mounted on this model. Mounted on each side of the front-wheel hub are ratchet gears. The wheel and gears rotate as one unit on the stationary front axle.

Two foot-operated levers, spring-returned to their upper positions, are pivoted at the lower ends of the front fork, one on each side of the wheel. To each lever is attached a rack meshed with a gear that is mounted free on the front axle and next to the ratchet gear on its





a, Shire velocipede, 1879.
b, Fowler tricycle, 1880. (Patent Office model.)

a, Hammelmann tricycle, 1880. (Patent Office model.)
b, Smith tricycle, ca. 1880.

side of the wheel hub. A pawl on the free gear rotates the ratchet gear and the wheel in a forward direction when the foot lever is depressed. The two levers are independent of each other and are intended to be depressed alternately.

SMITH TRICYCLE, Ca. 1880

U. S. N. M. No. 211501; original; gift of Robert Atwater Smith in 1901; photograph No. 38609; plate 12, *b*.

According to the donor, this vehicle was called the American Lever Tricycle, and was made by the H. B. Smith Machine Co., of Smithville, N. J., well-known manufacturer of Star bicycles in the 1880's.

The rear wheels of the tricycle have separate axles, each independent of the other, and they are rotated by pedal levers that, when depressed, pull on straps wound around overrunning clutches on the axles. Springs return the drums of the clutches to rewind the straps when the pedal levers are allowed to rise. Each wheel is provided with its own axle, clutch, strap, and lever combination. The straps can be easily attached to either of two positions on the levers to provide two different mechanical advantages, or driving ratios.

The frame is of metal tubing. The three wheels have metal rims with radial wire spokes, and are of the type used by Smith. The rear wheels are 40 inches in diameter and the front wheel, 25½ inches. The track of the rear wheels is 29½ inches. A thin, solid rubber tire is attached to the front wheel, but the two rear tires are missing.

A wooden saddle (not original) mounted on springs is attached to the upper end of a rod that can be raised or lowered to suit the rider. A lever, actuating a friction brake that rubs against the tire on the front wheel, is pivoted on the right handle bar. A small metal mudguard is secured over the rear of the front wheel.

BICYCLE, Ca. 1880

U. S. N. M. No. 248836; original; gift of Thomas M. Wilkins in 1908; photograph No. 30650–F; plate 13, *a*.

The maker of this Star is not known, no identifying marks or dates appearing on it, but it was probably an early product of the H. B. Smith Machine Co., as its major parts closely resemble those of the 1885 Smith Star in the collection. According to the donor, this machine was given to his father, B. F. Wilkins, around 1900. Mr. Wilkins, a member of the Capitol Bicycle Club of Washington, D. C., never rode it, as it was considered a relic when he acquired it.

One side of the triangular metal frame consists of a tube for the steering post, at the lower end of which is a fork supporting the front wheel. Straight handle bars are attached to the upper end of

the post. The metal front wheel, fitted with a solid rubber tire 23 inches in diameter, has 28 radial wire spokes. The rear wheel, also fitted with a solid rubber tire, is 55 inches in diameter and has 64 radial wire spokes.

Spring-returned, overrunning clutches are attached to the ends of the rear axle. The wheel is turned by leather straps wound on the clutches and attached to pedal levers (see the description of the Smith tricycle). The effective attachment point of the straps to the levers can be adjusted to either of two positions, by means of a pivoted linkage, to provide a "gear shift," so to speak, as two driving ratios are made available.

The leather saddle is adjustably mounted upon a broad flat spring. A brake, bearing against the rear tire, is operated by a linkage on the handle bars and is controlled by the rider's right hand. The linkage is returned by a coil spring to the "off" position. Another coil spring, located at the base of the steering post, serves as a shock absorber.

KLAHR BICYCLE, 1883

U. S. N. M. No. 309259; original Patent Office model; transferred from the U. S. Patent Office; photograph No. 784; plate 14, *a*.

Patent No. 285821 was issued on October 2, 1883, to William Klahr, of Myerstown, Pa., for a bicycle. This model shows a bicycle of the Star type, propelled by single-acting pedal levers in combination with racks, pinions, and clutches on the rear axle.

The model, measuring 6 inches long, 4½ inches high, and 1 inch wide, is constructed entirely of metal with the exception of the tires. The triangular frame supports a vertical steering fork with a small wheel at the front, and a large driving wheel at the rear. Both wheels are radially wire-spoked and are 1½ inches and 3½ inches in diameter, respectively. The upper extension of the fork is at an angle to the fork itself, and is fitted with handle bars at its upper end. A coil spring tends to keep the fork centered, with the wheel headed straight ahead on the machine.

A rear extension of the lower or horizontal forked member of the frame extends back of the rear-wheel axle, on each side of that wheel. Long curved arms, with pedals at their front ends, are pivoted from the rear ends of these extensions. Slightly curved racks extend upwards from each arm, each rack meshing with a gear on the axle of the rear wheel. Each of these gears incorporates an overrunning clutch, so that when the arms are depressed by foot pressure the gears will drive the rear wheel forward. When the arms return by spring pressure to their upper positions, the overrunning clutches operate, and so do not hinder the forward motion of the machine. The

a, Bicycle, ca. 1880.
b, Smith bicycle, 1885.

a, Klahr bicycle, 1883. (Patent Office model.)
b, New Rapid bicycle, 1889.

two arms are independent of each other but are intended to be depressed alternately. Part of the gearing is missing from the right side of the model.

A saddle is located on a leaf spring over the rear wheel. A spring-returned foot brake, operated by the left foot, is mounted in front of the rear wheel, and rubs against the rear tire.

SMITH BICYCLE, 1885

U. S. N. M. No. 279005; original; gift of Robert Atwater Smith in 1913; photograph No. 797½–E; plate 13, *b*.

This Star bicycle was made by the H. B. Smith Machine Co. and bears their nameplate marked with the serial number 3025 and the patent dates of October 26 and November 23, 1880, January 29, 1884, and July 7, 1885. It was probably constructed in the latter year.

Patent Office records reveal that patents No. 321819 and 321932 were both issued on July 7, 1885, to William S. Kelley, of Smithville, N. J. Both show bicycles of the Star type, and claim improvements in bicycles and tricycles.

This bicycle is very similar in appearance to the full-sized Star previously described, its method of steering and operation being the same. The steering post is not within a tube, however. The metal front wheel is fitted with a solid rubber tire. It is 23 inches in diameter and contains 24 wire spokes. The rear wheel, also of metal, is fitted with a single-tube pneumatic tire of 40-inch diameter and contains 72 tangential wire spokes.

The leather saddle is mounted on springs and is adjustable fore and aft. The handle bars are curved. Linkage, operated by the rider's right hand, causes a spoon brake to bear against the rear tire. The linkage is returned by a flat leaf spring to the "off" position. As on the earlier Star, two driving ratios are available by shifting the effective attachment point of the straps to the foot levers.

COLUMBIA BICYCLE, 1886

U. S. N. M. No. 307217; original; gift of Lawrence Worstall in 1921; photograph No. 797½–C; plate 15, *a*.

Owned in turn by Herschal Mulford and Lawrence Worstall, of Millville, N. J., this early Columbia high-wheeler, or ordinary, is a Light Roadster model of 1886.

Sold originally for approximately $135, the Light Roadster was a lighter version of the Expert model and weighed approximately 36 pounds with all equipment, as compared to the Expert's 45 pounds.

These bicycles were available with seven sizes of front wheel, from 47 to 59 inches, and two sizes of rear wheel, 16 or 18 inches, depending

on the size of the front wheel. This example is fitted with a 60-spoke, 53-inch front wheel, and a 20-spoke, 18-inch rear wheel, these dimensions including the thickness of the solid rubber tires.

The felloes of the wheels are of seamless steel tubing rolled into a hollow crescent, the spokes are of steel wire, and the hub flanges are of light forged steel rigidly secured to steel axles. The axles are mounted on adjustable ball bearings.

Adjustable, detachable cranks, providing from 4¼ to 5¼ inches of throw, are fitted to the front axle, with rubber-covered pedals attached to the cranks.

The curved perch has a tapering, circular cross section and is made of imported, cold-drawn, seamless steel tubing; the front fork is of the same material but elliptical in cross section; and the rear fork is semitubular.

The steering head is cylindrical and slightly tapered. The handle-bar lug is forged solid with it.

The machine is equipped with a Kirkpatrick-type leather saddle suspended on fore-and-aft springs; hollow, curved handle bars of steel tubing fitted with pear-shaped vulcanite handles; a step attached to the lower left of the perch; a steel leg guard; and a friction brake, operated by the rider's right hand, that works against the tire of the front wheel.

Catalogs of the Pope Manufacturing Co. reveal that 1892 was the last year it offered high-wheeled bicycles, and that it never made machines of the Star type.

OVERMAN BICYCLE, 1886

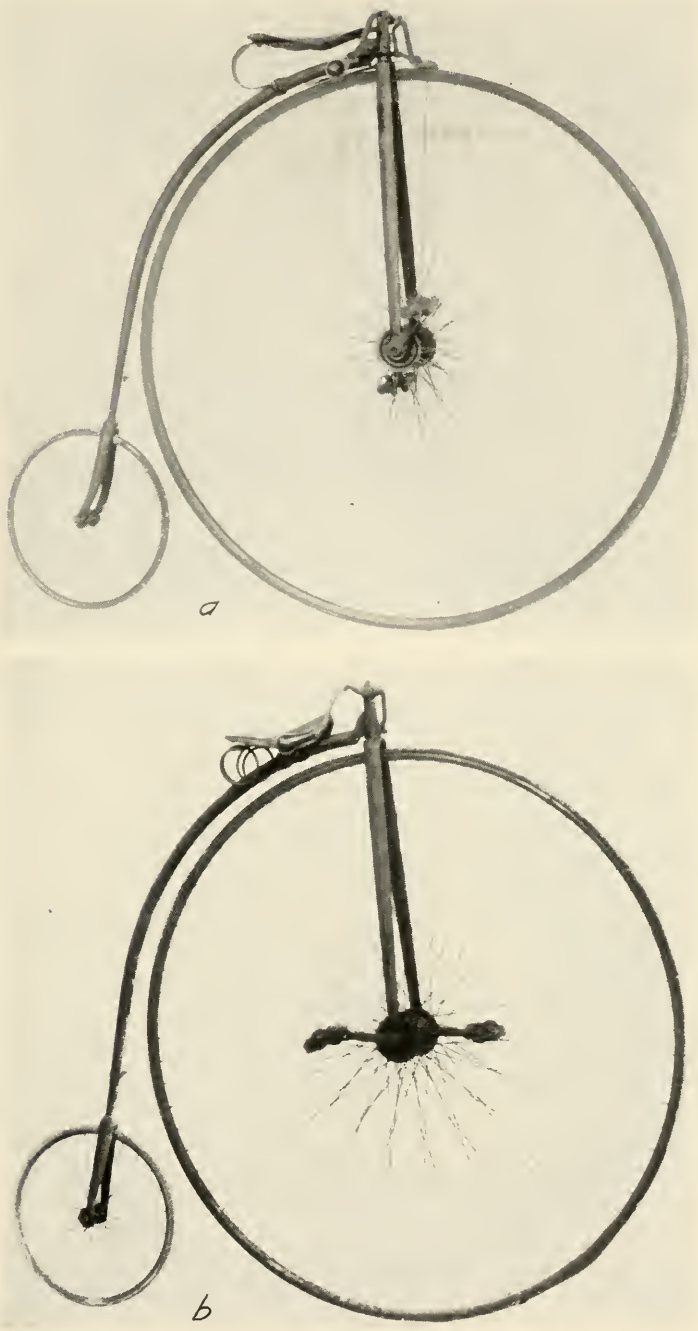
U. S. N. M. No. 307216; original; gift of Edward Hosea Sithens in 1921; photograph No. 811-B; plate 15, *b*.

This ordinary, built by the Overman Wheel Co., of Boston, Mass., was their Victor model, and was ridden to many racing victories in the late 1880's by Stacy Cassady, of Millville, N. J. It was probably built in 1886, as the latest patent date on its nameplate is December 1, 1885.

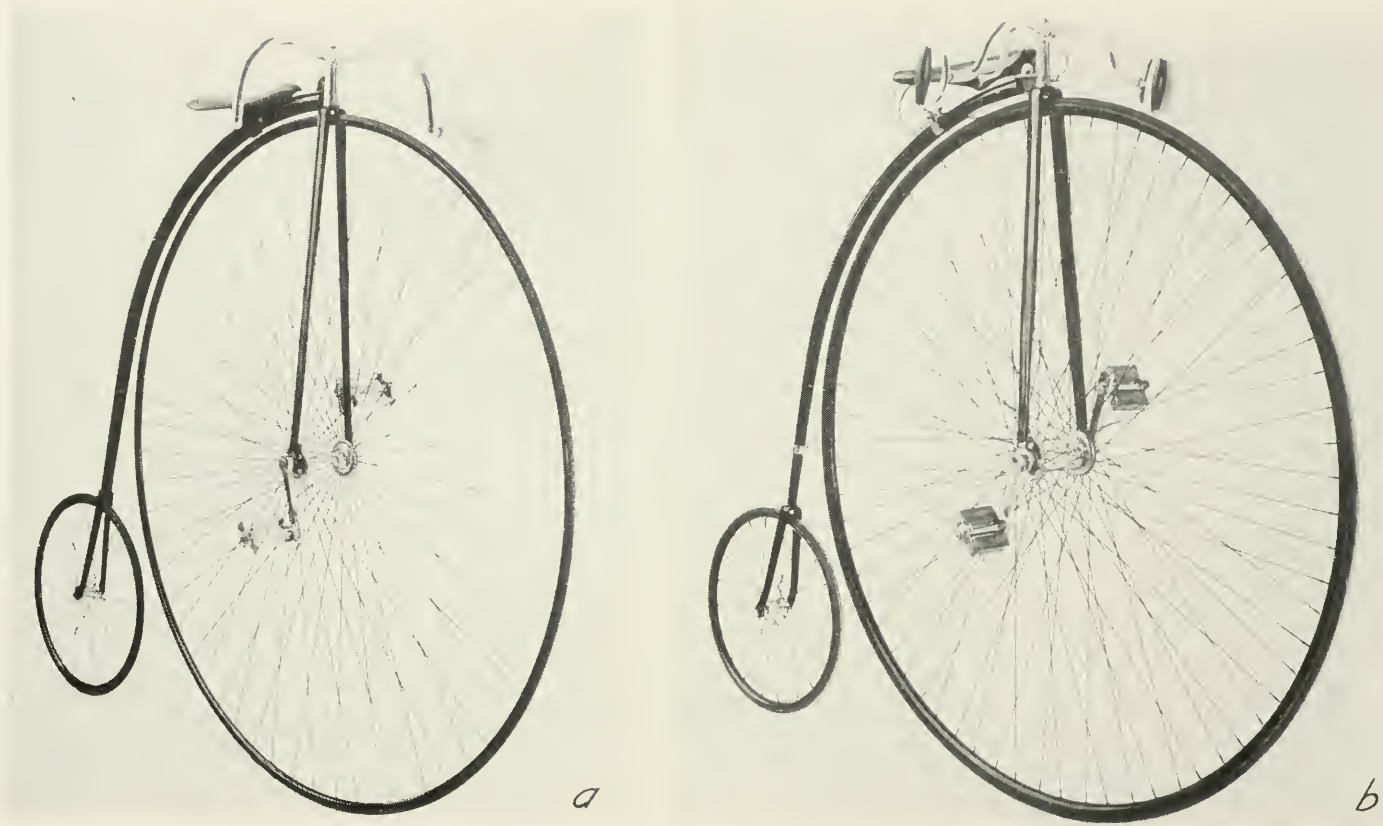
In appearance it is very similar to the Columbia Light Roadster, though larger and of heavier construction. The front wheel is 54 inches in diameter and contains 72 wire spokes, while the rear wheel is 18 inches in diameter, with 24 wire spokes. The spokes are tangentially laced to the hubs.

Adjustable cranks with rubber-covered pedals provide for a throw of from 5 to 5¾ inches.

The machine is equipped with a leather saddle, a step attached to the lower left of the curved perch, and curved handle bars. There is



a, Columbia bicycle, 1886.
b, Overman bicycle, 1886.



a, Beeston Humber racing bicycle, 1886.
b, Columbia bicycle, 1888.

evidence to indicate that a brake, operating against the tire of the front wheel, was once fitted to the machine.

BEESTON HUMBER RACING BICYCLE, 1886

U. S. N. M. No. 310818; original; gift of Albert E. Schaaf in 1934; photograph No. 41349–A; plate 16, *a*.

This lightweight racing bicycle, weighing only 24 pounds, was built by Humber and Co., Ltd., of Beeston, Nottingham, England, in 1886 and was completely restored to new condition by its donor before being presented to the National Museum. This make of ordinary was ridden by many world's champions in the 1880's.

As does the Overman Victor, this Humber closely resembles the 1886 Columbia in general shape. The diameter of the front wheel with its solid rubber tire is 52 inches, while that of the rear wheel is 18 inches. The wheels are fitted, respectively, with 60 and 20 radial wire spokes.

Adjustable cranks, providing from 4 to 5¼ inches of throw, are attached to the front axle. The pedals are not rubber covered.

The leather saddle is secured directly to the perch without the benefit of springs, and there is no step and no brake, all of which aided in keeping the weight to a minimum. The curved handle bars are fitted with smooth, white grips.

STARLEY BICYCLE, Ca. 1887

U. S. N. M. No. 218218; original; gift of J. E. Hosford in 1903; photograph No. 811–D; plate 17, *a*.

This "Psycho" bicycle, built by Starley Brothers, St. John's Works, Coventry, England, is of the improved cross-frame, safety type, with a crank-bracket stay, a stay between the steering head and the top of the saddle post, and a pair of stays from the rear end of the rear fork to the top of the saddle post. In 1887 the manufacturers of this machine were awarded a gold medal at the International Exhibition at Toulouse, France.

The frame is of metal tubing, the handle bars are metal with wooden grips on each end, and the Brooks saddle, of leather over coil springs, is adjustable both vertically and fore and aft.

Each wheel, 30 inches in diameter, has a thin solid-rubber tire and 48 radial wire spokes. The rear-wheel sprocket, on the right side of the wheel, is driven by a block chain from the front sprocket, which is equipped with pedals adjustable in throw from 5½ to 6½ inches. The chain tension is adjusted by moving the rear axle backwards or forwards in slots at the rear end of the rear fork. There is no

coaster attachment, the pedals always turning while the bicycle is in motion. Oil cups are provided in the hub of each wheel.

A metal mudguard is secured over the rear of the front wheel, but only the lower portion of the rear mudguard remains. The upper portion is missing. A small footrest is attached to each side of the front-wheel fork, for use while coasting. A step is attached to the left side of the rear fork for use when mounting the machine. A warning bell is affixed to the left handle bar, and a lever for hand operation of the front-wheel brake spoon is pivoted on the right handle bar. A flat leaf spring normally holds the spoon away from the tire. A support for a head lamp, now missing, is mounted on the upper part of the front fork so that the lamp's rays would always be thrown in the direction of the front wheel's travel.

COLUMBIA BICYCLE, 1888

U. S. N. M. No. 313371; original; gift of Albert E. Schaaf in 1949; photograph No. 41349; plate 16, *b*.

This ordinary, a Columbia Light Roadster of 1888, is very similar, both in design and appearance, to the corresponding model of 1886, though it was sold for slightly less, approximately $125. Its weight, with all equipment, is 42 pounds.

This example is fitted with a 68-spoke, 53-inch front wheel, and a 20-spoke, 18-inch rear wheel. The wire spokes are tangentially laced to the hubs.

The adjustable cranks, attached to the front axle, provide a throw of from 5 to 6 inches. The pedals are rubber covered.

The slight differences between this and the 1886 model include the method of springing the saddle, the shape of the handle bars and of the grips, and the fact that the step is adjustable.

This machine was completely restored to new condition by its donor before being presented to the National Museum. It is finished in black paint and chromium plate.

NEW RAPID BICYCLE, 1889

U. S. N. M. No. 201660; original; gift of H. K. Griffith in 1899; photograph No. 811–C; plate 14, *b*.

This bicycle is one of the improved cross-frame, safety type, with a chain strut, a crank-bracket stay, and a stay between the steering head and the top of the saddle post. It is an example of one of the many makes of English bicycles of the 1880's and was manufactured by the St. George's Engineering Co., of Birmingham, England.

The frame is of metal tubing, the tangentially-wire-spoked wheels are of metal with thin solid rubber tires, the handle bars are metal

with wooden grips on each end, and the saddle is composed of leather and springs. The lower end of the vertical section of the frame is articulated, for adjusting the tension of the driving chain. The single chain strut is to the left of the rear wheel, as is the chain itself. This strut, as well as the crank-bracket stay, required adjusting in order to swing forward the articulated section of the frame for tightening the chain tension.

The rear wheel is 31½ inches in diameter, while the front wheel is slightly smaller, being 30 inches in diameter. Each contains 48 spokes. The rear-wheel sprocket is driven by a block chain from the front sprocket, which is equipped with pedals adjustable in throw from 4¾ to about 6 inches. There is no coaster attachment, the pedals always turning while the bicycle is in motion. Oil cups are provided in the hub of each wheel.

A small metal mudguard is secured over the rear wheel, and it is thought that originally another was located over the rear part of the front wheel. A small footrest is attached to each side of the front-wheel fork, for use while coasting. A step is attached to the left side of the rear fork, for use by the rider in mounting the machine. A warning bell is attached to the left handle bar, and a lever for hand operation of the front-wheel brake spoon is pivoted on the right handle bar. A coil spring normally holds the spoon away from the tire.

A small leather tool bag hangs from the steering-head stay. Attached to a bracket on the front of the steering head is an oil lamp marked "Zacharias & Smith, Bicycle Sundries, Newark, N. J." In addition to the round clear glass in front, the lamp is fitted with a green glass in the right side and a red glass in the left side.

OVERMAN BICYCLE, 1889

U. S. N. M. No. 214971; original; gift of Miss May H. Mead in 1903; photograph No. 30650–A; plate 17, *b*.

Made by the Overman Wheel Co., of Boston, Mass., this bicycle was their Victoria model, for women. It bears a nameplate carrying patent dates ranging from November 20, 1877, to July 9, 1889.

This type of bicycle with a drop frame was invented in order that a woman could sit astride without having her skirt caught on the cross bar. Its adoption greatly increased the popularity of the bicycle and helped make cycling a sociable recreation as well as a sport and a means of transportation.

The frame is of metal tubing, the wheels are of metal with tangential wire spokes, the thin tires are of solid rubber, and the curved handle bars are of metal with spade handles on each end. The saddle,

made of leather stretched across several sets of coil springs, is adjustable vertically and fore and aft. A curved brace at the bottom of the frame serves to strengthen it.

The front wheel is 28 inches in diameter and contains 24 spokes. The rear wheel has the same diameter but contains 32 spokes. The rear-wheel sprocket, which is on the right side of the wheel, is driven by a block chain from the front sprocket, the latter being equipped with pedals having a nonadjustable throw of 5¾ inches. Adjustment of the chain tension is obtained by moving the rear axle backwards or forwards in slots at the rear end of the rear fork. There is no coaster attachment, the pedals always turning while the bicycle is in motion. Oil cups are provided in the hub of each wheel.

The front fork of the machine is of interesting construction, being designed to reduce the road shocks transmitted to the handle bars. It consists of a pair of hinged, straight arms and a set of four curved spring arms, so arranged that the straight arms, which are compression members, act to steady the movement of the spring arms, which carry the load and reduce the road shocks. Footrests are attached to the outer sides of the spring arms, for use while coasting. A small mudguard is secured at the rear of the front wheel.

A large mudguard is mounted over the rear wheel, a chain guard surrounds the chain almost completely, and twine laced on the mudguard and the chain guard protects the rider's skirts from becoming entangled in the wheel spokes or the chain.

On the right handle bar is a pivoted lever that controls a rear-wheel spoon brake by means of a system of wires and pivoted arms. A wire spring at the spoon normally holds it away from the tire. A head lamp support is mounted on the upper part of the front fork.

COLUMBIA BICYCLE, 1896

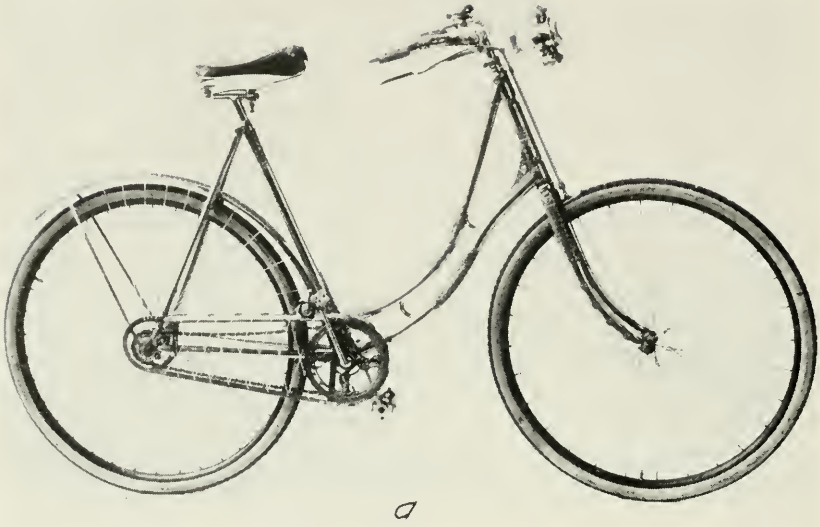
U. S. N. M. No. 313486; original; gift of Col. N. J. Wiley in 1950; photograph No. 41230; plate 18, *a*.

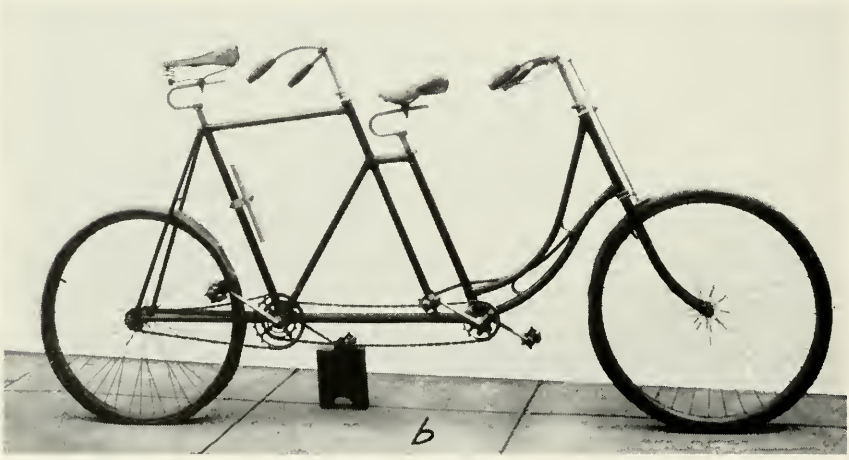
This highly decorated, drop-frame bicycle was formerly the possession of Mrs. M. N. Wiley, mother of the donor, of Montgomery, Ala. The frame is nickel-plated, with gold-plated decorations. On the steering head appear the initials "MNW" in gold, emblazoned with small, cut diamonds and emeralds.

High-carbon-steel tubing and 4½ percent nickel-steel tubing are used in the frame, the joints and brackets of which are machined forgings. Unlike the 1889 Overman bicycle, this Columbia machine has a double-drop frame, and two small gusset plates connect the bars for additional strength.

The wheel rims of laminated wood are approximately 25 inches in diameter and have 28 and 36 tangential steel spokes, respectively, front

a, Starley bicycle, ca. 1887.
b, Overman bicycle, 1889.





a, Columbia bicycle, 1896.
b, Columbia tandem bicycle, 1896.

and rear. They are fitted with 28-inch, single-tube, pneumatic tires. The tires are not original, but are replacements of about 1930. The hubs are machined from solid drop forgings of steel, and are fitted with detachable ball cases for the bearings. Each end of the front and rear axles is supported on a ball bearing. Lubrication is through oil holes in the wheel hubs.

The rear-wheel sprocket is driven by a block chain, on the right side of the machine, that passes over the front sprocket. The tension of the chain is adjusted by moving the rear axle backwards or forwards in slots at the rear end of the rear fork. There is no coaster attachment, the pedals always turning while the bicycle is in motion. The nonadjustable crank throws are 6 inches in length, and the pedals are rubber covered and mounted on ball bearings. The two halves of the crank assembly are dovetailed together within the crank hanger, yet can be easily separated and removed from the hanger, which is fitted with two covered oil holes for lubrication of the crank ball bearings.

The curved, tubular handle bars are tipped with ivory grips bordered with wide, silver bands. The bars themselves are embellished with gold-plated, flowerlike decorations, as is the frame.

A rear mudguard and a chain guard, also nickel-plated and decorated, are supplied, as is a hand-operated spoon brake operating on the front tire and controlled by a lever pivoted on the right handle bar. Twine is laced across the chain guard and the rear mudguard to protect the rider's clothing.

The decorated leather saddle is the Columbia Model 22, introduced in 1896. It consists of a black leather seat resting on a flat spring, with a spiral spring at the rear. It is adjustable vertically, as well as backwards and forwards.

An oil lamp marked "Aladdin, Tiffany & Co., sterling," fitted with a large clear lens in the front, and small red and green lenses in the left and right sides, is attached to a bracket at the front fork. Footrests are not provided on the fork. A decorated warning bell is fitted to the left handle bar.

This machine is a Model 41 Columbia, made by the Pope Manufacturing Co., of Hartford, Conn. It weighs approximately 30 pounds, and bears the serial number 12877.

COLUMBIA TANDEM BICYCLE, 1896

U. S. N. M. No. 309506; original; gift of Mr. and Mrs. Goldwin Goldsmith in 1928; photograph No. 767; plate 18, *b*.

After the drop frame was invented, adapting the bicycle to women's use, the combination composed of the diamond frame and the drop frame, thus forming a tandem bicycle, became very popular.

This Model 43 Columbia bicycle, manufactured by the Pope Manufacturing Co., Hartford, Conn., was purchased in Washington, D. C., in the spring of 1896 for $150, and was then used by the donors for a honeymoon tour through Europe.

The frame is made of high-carbon-steel and nickel-steel tubing, the handle bars are tubular with vulcanite-tipped cork handles, and the wheel rims are of laminated wood.

The diameter of each wheel with tire is the same, 28 inches, the front wheel containing 36 tangentially laced steel spokes, and the rear containing 44. The hubs are machined from solid drop forgings of steel, and are fitted with detachable ball cases for the bearings. The tires are 1¾-inch, single-tube pneumatics, made by the Hartford Rubber Works Co., a subsidiary of the Pope Manufacturing Co.

The rear-wheel sprocket, on the right side of the hub, is driven by a block chain from the larger of the two center sprockets. Another block chain connects the smaller sprocket of the center pair to the front sprocket. Adjustment of the rear-chain tension is obtained by moving the rear axle backward or forward in slots at the rear ends of the rear fork, while adjustment of the front-chain tension is obtained by turning the eccentrically mounted front-crank bearing bushing in the frame, thus moving the front sprocket backward or forward. The throw of the pedals is not adjustable, the front throw being 6 inches and the rear, 7½ inches.

There is no coaster attachment, the pedals always turning while the bicycle is in motion. No footrests are attached to the front fork for use while coasting.

The rear handle bars turn in unison with the front, a drag link connecting short arms attached to the lower ends of the steering posts.

A warning bell is secured to the left handle bar, and a lever for hand operation of the front-wheel brake spoon is pivoted on the right handle bar. A small coil spring at the pivot normally holds the spoon away from the tire.

The two saddles are fully adjustable for position, and are made of leather and metal. In addition, the front saddle has a wooden base. A hand-operated tire pump is secured to the center section of the diamond part of the frame. There are no mudguards, though they were originally available as optional equipment. There is also no chain guard for the front sprocket, another originally available item. The machine weighs approximately 46 pounds.

CLARKE GASOLINE TRICYCLE, 1897

U. S. N. M. No. 313142; original; gift of Louis S. Clarke in 1947; photograph No. 37887–A; plate 19.

In 1897, Louis S. Clarke founded the Pittsburg Motor Vehicle Co., Pittsburgh, Pa., with himself as president and engineer, and constructed this experimental motor tricycle. The next year, with the experience thus gained, the company built a 4-wheeled automobile. In 1899, the company name was changed to the Autocar Co., which today is one of a small number of surviving pioneer automobile companies. This tricycle is known as the first Autocar.

The vehicle is a conventional tricycle with a gasoline engine driving the rear wheels. The frame is built of standard bicycle parts, with special parts designed and made by Mr. Clarke. The 1-cyclinder, gasoline engine with mechanically operated exhaust valve and automatic intake valve has a gear on its crankshaft extension meshing directly with the ring gear of the differential. No gear changes are provided. A clutch located on the crankshaft extension between the engine and the driving gear, and a band brake on the drum of the clutch, are operated by a single hand lever.

No throttle is provided, but speed of the engine was varied by means of a spark-advance lever. A fuel-flow regulator is provided on the exhaust-heated, gasoline vaporizer. The main exhaust pipe leads into a small muffler. The gasoline tank is located in the frame beneath the saddle, and the high-tension coil and batteries are in a box farther forward in the frame.

Bicycle pedals, with the usual sprockets and chain, enabled the rider to start the engine, or in the event of an emergency to pedal the vehicle. An overrunning clutch is built into this gearing so that the pedals are not driven by the engine while the tricycle is in motion.

The three wire-spoked, bicycle-type wheels mount 26-by-2½-inch single-tube, pneumatic tires. Mr. Clarke states that the front tire is one of the original three and has never been off the wheel since its installation. The front wheel is supported in a fork and is steered by handle bars.

The saddle, the handle-bar grips, the spark plug, a spark coil of about 1904, the two rear tires, and a relief pipe and valve on the crankcase of the engine are not original.

CHILD'S BICYCLE, Ca. 1897

U. S. N. M. No. 311549; original; gift of J. Ralph Cline in 1938; photograph No. 38609–C; plate 20, *a*.

This bicycle is thought to be one of the first built for a small child, and was used by the donor in October 1897, at the age of 3½ years. The maker is not identified.

The frame is of the modern diamond-shaped type, and is constructed of tubing. The handle bars are of curved wood and are mounted on the upper end of the fork supporting the front wheel. A hand-operated warning bell is mounted on the right handle bar. The saddle is of leather with a metal frame.

The two wheels are identical and consist of metal hubs supporting 12-inch-diameter wooden rims with tangential wire spokes. Single-tube pneumatic tires are provided. The drive to the rear wheel is by chain and sprocket, the front sprocket mounting two pedals in the modern manner. No brake is provided.

CHILD'S QUADRICYCLE, Ca. 1900

U. S. N. M. No. 312869; original; gift of Robert C. King in 1945; photograph No. 41231; plate 20, *b*.

Used about 1900 by the donor when a child, this small quadricycle, or Irish Mail as it was popularly called, was made by the Wabash Manufacturing Co., of Wabash, Ind.

Of simple and inexpensive construction, the vehicle is made primarily of strap steel. The arched frame supports a pivoted axle at the front, and at the rear a crank axle to which only the right wheel is pinned, the left running free on it. The rear wheels, of metal with solid rubber tires, are 15 inches in diameter and have a tread of 16 inches. The rear axle and right wheel are driven by the fore-and-aft motion of a pivoted lever at the front of the frame, the lower end of the lever being connected to the crank of the axle. A wooden handle is at the top of the lever.

The front wheels, similar in construction to the rear, are 11 inches in diameter and have a tread of 15¼ inches. The axle is steered by the feet of the rider.

The wheel base is 23½ inches. A rectangular wooden seat is secured to the top of the frame. The machine is painted red with white decorations.

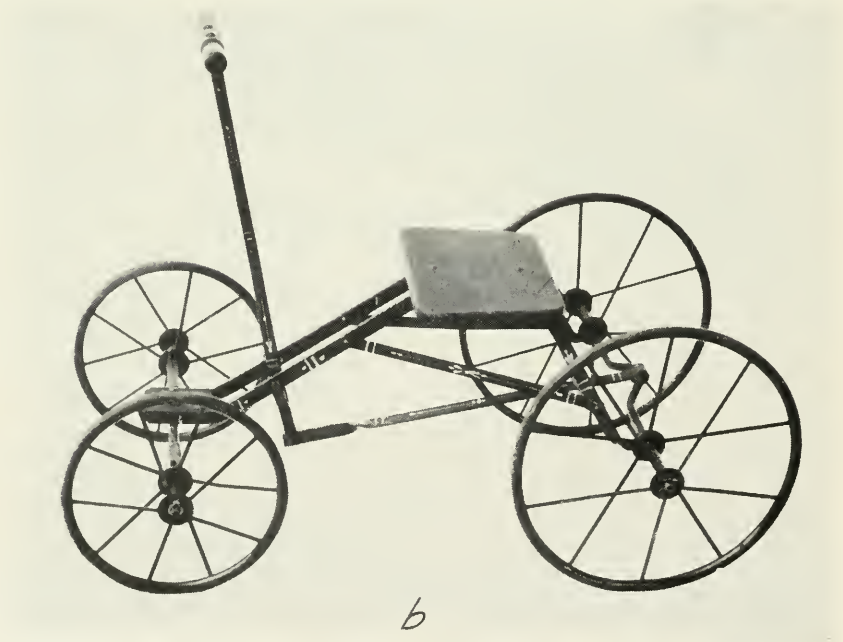
PIERCE BICYCLE, Ca. 1900

U. S. N. M. No. 309386; original; gift of Barton A. Bean in 1928; photograph No. 797½; plate 21, *a*.

This bicycle was built by the Geo. N. Pierce Co., of Buffalo, N. Y., also known as the makers of the early Pierce Motorette automobiles. In time, the Pierce automobile became known as the Pierce-Arrow, while the Pierce bicycles and Pierce 1- and 4-cylinder motorcycles were built by the Pierce Cycle Co., a subsidiary of the original company. The Pierce Cycle Co. was headed by Percy Pierce, son of George, when receivers were appointed for it in 1910.

Clarke gasoline tricycle, 1897.

a



b

a, Child's bicycle, ca. 1897.
b, Child's quadricycle, ca. 1900.

To attain the utmost in simplicity and cleanliness a shaft-and-gear drive was used in place of the usual chain drive of that period. It operates through two pairs of bevel gears, one pair at each end of the drive shaft, to a New Departure coaster brake incorporated in the rear-wheel hub. The drive shaft is contained in the right member of the lower rear fork. The elimination of sprockets and chain protected the rider from grease, while the enclosing of the gears protected the mechanism from dirt.

The wooden rims, 24 inches in diameter, mount single-tube, pneumatic tires. The front wheel contains 32 tangentially laced wire spokes, and the rear wheel contains 36. An oil hole with a sliding cover is provided in the rear hub. The nonadjustable pedal throw is 7 inches. The rear wheel is turned approximately three revolutions for each turn of the pedals.

The frame is sprung, both front and rear, for easier riding. Each side of the front fork is composed of several spring leaves, while the upper end of the upper rear fork incorporates a telescopic section containing a coil spring. The housing of the spring is marked "Pierce hygienic cushion frame, licensed by Hygienic Wheel Co.," and bears patent dates ranging from July 21, 1896, to January 31,1899.

The curved, tubular, nonadjustable handle bars are fitted with grips which appear to be of leather. The saddle is a Christy No. 3 and bears patent dates ranging from January 15, 1895, to June 21, 1898.

On the steering head of the frame appears a nameplate marked "The Geo. N. Pierce Co., Makers, Buffalo, N. Y., U. S. A.—Tried and True." The name "Pierce" also appears, backed by the design of an arrow. Patent dates on the plate range from April 28, 1885, to May 10, 1898.

ANDERSON MILITARY BICYCLE, Ca. 1900

U. S. N. M. No. 309686; original; gift of James C. Anderson, deceased, through Russell A. Conn in 1929; photograph No. 19997; plate 21, *b*.

Patent No. 633745 for a "military bicycle" was granted to James C. Anderson of Highland Park, Ill., on September 26, 1899. Subsequently such a machine was built, following closely but not exactly the drawings of the patent application. The application says of it:

> In a machine for personal locomotion, propelled wholly by the human body, whether used for transportation of the rider only or for the additional service of a carrier, especially for carrying the necessary equipments of a soldier, it is not only desirable that the machine should be compact and small as possible, but it should, as it were, fit the rider mounted thereon in an upright soldierly position, which position is manifestly best suited to the human anatomy and best conserves the human force of the body in propelling the machine, as well as in maintaining the proper equilibrium. In other words, the articulation of the body of the rider and of the machine should compensate each other, and

in such a wheel it is also desirable that the rider should be able to mount in front, and when occasion requires to dismount forwardly or in the direction of the motion of the wheel, and hence it is important that his movements should not be obstructed by the usual arrangement of handle-bars in front of him.

Actually the machine is somewhat like a small Star bicycle designed to go backwards, as the tubular, triangular frame has two wheels of different sizes, with the small one mounted in a fork for steering purposes. However, the fork and steering wheel are at the rear of the machine, rather than at the front as on the Star. The upper end of the steering post is fitted with a small gear sector worked by a similar sector fitted to the axis of the curved, tubular handle bars, so that turning the handle bars will turn the small wheel. Adjustable cork-covered grips are fitted to the handle bars.

A Christy saddle, bearing patent dates ranging from January 15, 1895, to April 19, 1898, is located directly above the gear sectors. The saddle is made of leather and horse hair on a metal frame, and faces in the direction of the larger wheel. A rider, seated on the saddle, would find his hands on the handle bars at a level slightly below that of the saddle. On the patent application appears the suggestion that the saddle post be geared to the steering post, so that by swinging the body and saddle the machine could be steered. The example, however, does not employ this interesting feature.

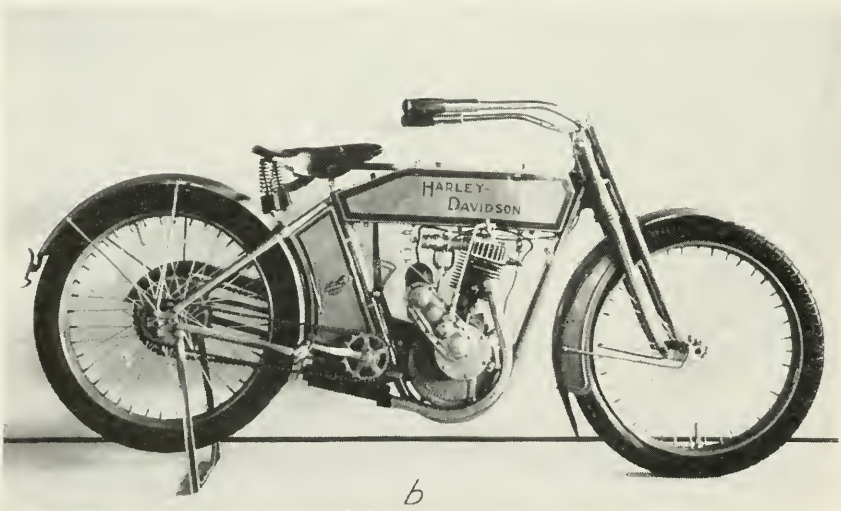
The wheel rims are made of laminated wood and are fitted with single-tube, pneumatic tires. Tangentially laced wire spokes are used. The front wheel is 20 inches in diameter and the rear, 11 inches. Each is marked "Fairbanks Boston laminated wood rim, Bradford, Penn., Bedford, Mass., Pat. May 9, 1893." The tires, which show signs of age, barely reveal the patent date of May 23, 1893, and the words "Newton Upper Falls, Mass."

The front wheel is driven by means of pedals and gearing, three revolutions of the wheel occurring for each turn of the pedals. The pedals are made of metal with rubber pads, and were a product of the Lavigne and Scott Manufacturing Co., of New Haven, Conn. They bear the patent date July 21, 1896. The pedal throw, which is not adjustable, is 6¼ inches. A small spoon brake, actuated by the foot, is mounted to the rear of the front wheel.

Within the triangular frame is a sheet metal hanger for carrying a rifle pointed in the direction of travel of the machine, presumably so that it could be siezed and used by the rider.

A framework of tubes and braces is attached to the upper rear of the frame, and was apparently intended to carry equipment. A leather tool bag marked "Eclipse" is located beneath the framework. Correspondence in 1929 with the Eclipse Machine Co., Elmira, N. Y., revealed that the tool bag and a few other components of the vehicle were of the type supplied by them before the turn of the century,

a, Pierce bicycle, ca. 1900.
b, Anderson military bicycle, ca. 1900.



a, Indian motorcycle, 1902.
b, Harley-Davidson motorcycle, 1913.

but that they knew nothing of the actual bicycle. It is apparently the only bicycle of its kind, and was probably built for Mr. Anderson by a local machinist. Its weight is approximately 45 pounds.

INDIAN MOTORCYCLE, 1902

U. S. N. M. No. 309934; original; gift of Indian Motocycle Co. in 1930; photograph No. 39052; plate 22, *a*.

The design of this machine was conceived in 1901 by the noted bicycle racer Oscar Hedstrom for the Hendee Manufacturing Co., of Springfield, Mass., later to be known as the Indian Motocycle Co. This machine was made in 1902, the year that the model was first offered for sale. The engine number is 150.

The motorcycle is equipped with a 1¾-horsepower, 1-cylinder, 4-cycle, air-cooled, gasoline engine with an automatic intake valve and a cam-actuated exhaust valve. Dry cells, a coil, a timer, and a spark plug compose the ignition system, the timer being advanced and retarded by a small lever at the front of the frame on the steering head. This lever was used also for the compression release, lifting the exhaust valve from its seat when moved to the retarded position, and as an ignition switch.

A float-equipped Hedstrom carburetor was supplied with gasoline from the tank on the rear fender. Another lever, on the frame crossbar, is designed for the fuel adjustment. A section of the tank contained oil, which flowed by gravity through a sight glass into the crankcase. A small exhaust pipe leads to a muffler beneath the crankcase.

Power was transmitted from the engine to the rear wheel by a double-reduction sprocket-and-chain drive on the left side of the frame. As the machine has no clutch or change gear, the engine is connected to the wheel at all times. A pedal-and-chain drive, incorporating a New Departure coaster brake, is provided on the right side to supplement the engine. The brake is engaged by slight backward pressure on the pedals. The pedals remain at rest when the engine is propelling the machine.

The diamond frame is of tubular construction, the wooden-rimmed wheels mount 28-by-1½-inch, single-tube, pneumatic tires, and the complete machine weighs just under 100 pounds.

HARLEY-DAVIDSON MOTORCYCLE, 1913

U. S. N. M. No. 313147; original; gift of Paul Edward Garber in 1947; photograph No. 37759; plate 22, *b*.

This motorcycle was purchased secondhand in 1918 by the donor and was used by him for several years. It was restored by the Harley-Davidson Motor Co. in 1947. The engine number is 4336–D.

It is equipped with a 5-horsepower, 1-cylinder, 4-cycle, air-cooled, gasoline engine of $3\frac{5}{16}$-inch bore and 4-inch stroke, giving a total piston displacement of 35 cubic inches. Known as the model Nine B, "5–35," it sold for $235 at the factory in Milwaukee, Wis.

The cylinder casting and its integral head are of heat-treated gray iron. The piston is heat treated and ground and is fitted with three piston rings and a hollow, steel wrist pin. An I-beam section of chrome-vanadium steel, fitted at both ends with phosphor-bronze bushings, serves as the connecting rod. Separate camshafts for the intake and exhaust valves are driven by gears in the magneto drive train. The overhead, intake valve is of nickel steel, while the 2-piece exhaust valve has a cast-iron head and a nickel-steel stem. The crankcase is of polished aluminum, with the hardened, tool-steel crankshaft mounted in it in phosphor-bronze bearings. An oil drain plug and an overflow pipe are provided in the crankcase.

Ignition is by Bosch high-tension magneto with spark plug, and the fuel is vaporized by a constant-level, float-equipped, Schebler carburetor. A priming petcock is located in the left side of the cylinder head. A 2-section tank, one for gasoline, the other for oil, is mounted at the upper bars of the frame, above the engine. Filler caps and shut-off metering valves are located on top of both tanks. The lubricating oil for the engine passes by gravity through a sight glass into the crankcase. Ignition and throttle are controlled by twisting the grips of the handle bars, the left for spark timing, the right for throttle opening.

The loop-type frame of brazed and welded steel tubing forms a cradle to support and protect the motor. Tubular handle bars are attached to a steering fork fitted with both main and recoil springs. The wire-spoked, metal-rimmed wheels now mount 28-by-3-inch clincher tires, though the original tires were 28 by $2\frac{1}{2}$ inches. A metal mudguard is located above each wheel, and a stand is supplied at the rear of the frame. Beneath the saddle is a metal tool box, and below the box is a muffler connected to the exhaust port by a curved pipe. The wheel base is 57 inches.

The rear wheel is driven by a double-reduction roller chain from a sprocket on the engine crankshaft to a sprocket on the left side of the rear-wheel hub, which is equipped with a clutch operated by a

hand lever on the left side of the machine. Forward motion of the lever engages the clutch. Metal guards cover the two chains. A pedal-and-chain drive, incorporating a New Departure coaster brake, is provided on the right side. With the rear wheel raised from the ground and the clutch engaged, the pedals can be used to crank the motor for starting. The pedals are not driven by the forward motion of the machine, and can be used to propel it in an emergency, in which case the clutch would be disengaged. The brake is engaged by slight backward pressure on the pedals.

CLEVELAND MOTORCYCLE, 1918

U. S. N. M. No. 313692; original; gift of Russell and Richard Fiedler in 1951; photograph No. 41801; frontispiece.

This motorcycle was built by the Cleveland Motorcycle Co., of Cleveland, Ohio, bears engine No. 5283, and cost $175, f.o.b. Cleveland. Advertisements of the period claimed 75 miles from a gallon of fuel, and 35 to 40 miles an hour for this machine. This make of motorcycle was introduced in August 1915, at which time the f.o.b. price was $150, and was one of the most popular lightweight motorcycles of the period.

The machine is equipped with a 2½-horsepower, 1-cylinder, 2-cycle, air-cooled, gasoline engine of 2½-inch bore and 2¾-inch stroke. The total piston displacement is 13½ cubic inches. The cylinder casting and its integral head are of cast iron. The carburetor, bolted to the inlet port at the front of the cylinder, is a Brown and Barlow, float-feed, single-jet type with auxiliary air control. The two hand-operated controls of the carburetor are located on the right handle bar. The motor is lubricated by mixing oil with gasoline in the fuel tank. Ignition is supplied by a Bosch high-tension magneto with spark plug.

The frame is of heavy-gauge seamless steel tubing, brazed at the joints, and the wheel base is 54 inches. The engine and gear box are secured in the frame by two large suspension bolts. The gear box is integral with the aluminum crankcase and contains a set of 2-speed sliding gears of chrome-nickel steel and a heat-treated, alloy-steel worm with a titanium-bronze worm gear, as well as a multiple-disc clutch composed of 13 hardened and ground steel discs. The low ratio of the gear box is 10 to 1, and the high ratio 6.1 to 1. The transmission gears are lubricated by running in an oil bath. Forward motion of a hand lever on the left side of the machine engages the clutch. A brake pedal, also on the left side, operates a contracting brake band on a drum on the left side of the rear wheel. Gear changes are made by a pedal operated by the right foot. A kick starter is

attached to the left side of the gear box. The rear wheel is driven by a roller chain from a sprocket on the output shaft of the transmission, on the right side of the machine. There is no guard over the chain.

The wire-spoked, metal-rimmed wheels mount 26-by-2½-inch clincher tires with inner tubes. Tubular handle bars with rubber grips are attached to the steering fork, which is fitted with a coil spring. A cylindrical, cast-aluminum muffler, mounted in front of the crankcase, is attached to the exhaust port of the cylinder. A metal mudguard is located above each wheel, and a stand is supplied at the rear of the frame. A cylindrical fuel tank suspended from the frame above the engine is fitted with a shut-off valve at the bottom. A small, metal, tool box is attached beneath the rear of the fuel tank. Rubber-covered footrests are provided adjacent to the brake and shift pedals. The saddle is a Mesinger "Auto Cushion." No battery, generator, lighting equipment, or warning signal is provided. The weight of the cycle is approximately 150 pounds.

This motorcycle was restored by the Museum staff during November and December, 1951, at which time it was disassembled, cleaned, refinished, and reassembled. The old tires of the early 1920's have been equipped with new butyl-rubber inner tubes. The 1926 license plate of the District of Columbia, attached to the rear fender at the time of presentation to the Museum, was also refinished with its original colors.

SNYDER BICYCLE, 1927

U. S. N. M. No. 309382; original; gift of the Homer P. Snyder Manufacturing Co., Inc., in 1927; photograph No. 811; plate 23, *a*.

This tubular, diamond-frame bicycle was made by the Homer P. Snyder Manufacturing Co., Inc., of Little Falls, N. Y. At the time of its receipt at the National Museum it was new and was among the most modern types of bicycles then manufactured in this country.

The hollow steel wheel rims carry the original 28-by-1½-inch, single-tube tires, No. 66 E. H., made by the Fisk Rubber Co., of Chicopee Falls, Mass. Each wheel contains 36 tangentially laced wire spokes, and the rear-wheel hub incorporates a Model-C New Departure coaster brake. Both wheel hubs run on ball bearings. Adjustment of the chain tension is obtained by moving the rear axle backward or forward in slots at the rear of the frame.

The drive to the rear wheel is by sprockets and a Diamond roller chain, located to the right of the wheel. The pedal throw, 6¾ inches, is nonadjustable. The two pedal cranks are in one piece, unlike the two-piece construction of the 1896 Columbia bicycle in the collection. The rubber-covered pedals are mounted on ball bearings.

The curved, tubular metal handle bars, with Grip-Well rubber grips, are strengthened with a cross brace. A hand-operated ratchet horn is mounted on the brace, and a McKeelite electric lamp is attached to the front of the bars.

The frame is strengthened at the top by means of an additional horizontal member, while the fork is supplemented with two vertical bars at its front. A metal tool box is placed between the two horizontal members of the frame. Beneath it hangs a metal container for the dry cell for the lamp. A switch is built into the cover at the front of the container.

The Troxel saddle of wood, leather, and coil springs is adjustable in all directions.

Front and rear mudguards, a luggage rack over the rear guard, which carries a red glass reflector, and a stand are provided, but no chain guard is supplied. The bicycle is finished with orange and black paint and with nickel plate. Its weight is approximately 50 pounds.

REINHARDT BICYCLE, 1935

U. S. N. M. No. 311533; original; gift of Fred A. Birchmore in 1938; photograph No. 33733; plate 23, *b*.

The donor, a resident of Athens, Ga., bought this bicycle in Gotha, Germany, in July 1935. An "Original Reinhardt," it was made by Fahrradfabrik Otto Reinhardt, Bielefeld, Germany, and was bought for 67 reichsmarks. In the course of the next two years Mr. Birchmore rode it through western Europe, eastern Europe, Crete, Cyprus, Egypt, Iraq, Iran, Afghanistan, India, Siam, Indochina, and the Philippines, before pedaling his bicycle home across the United States from California. It has been estimated that his travels covered approximately 40,000 miles, of which about 25,000 were on the bicycle, and the rest by boat. Approximately four saddle covers and seven sets of tires were worn out during the journey. The present tires were purchased from a shop in Calcutta, India.

The tubular metal frame is of the diamond, safety type, and is supported on metal-rimmed wheels, each containing 36 tangentially laced wire spokes and fitted with 26-by-2.00-inch tires with inner tubes. The rear-wheel hub incorporates a coaster brake inscribed "Torpedo-System Sachs." Both wheel hubs run on ball bearings, and an oil cup is fitted to each. Adjustment of the chain tension is obtained by moving the rear axle backward or forward in slots at the rear of the frame.

The drive to the rear wheel is by sprockets and roller chain, located to the right of the wheel. The driving sprocket is mounted on a

3-piece crank assembly supported in two ball bearings in the crank hanger, which has an oil hole for lubrication. The pedal throw is 6⅞ inches and is nonadjustable. The pedals are rubber covered and are mounted on ball bearings.

The curved, tubular metal handle bars carry composition grips, and mount a warning bell on the left side. A Radsonne front lamp is attached to the front fork, just below the handle bars, and turns with it. The light switch is contained in the lamp. An Energie generator is clamped to the left side of the fork.

The presently installed saddle cover, a Luxus, is mounted on a metal-and-coil-spring base that is fully adjustable. Front and rear mudguards, a Pallas luggage rack over the rear guard, a tire pump, and a small leather tool bag are provided. The front brake, which formerly rubbed against the tire, is now missing. No chain guard is supplied. An American pennant is attached to the front mudguard. The weight of the machine is approximately 43 pounds.

WHALEN AND JANSSEN LAMINATED-WOOD-FRAME BICYCLE, 1942

U. S. N. M. No. 313040; original; gift of Webster E. Janssen in 1946; photograph No. 38609–B; plate 24, *a*.

At the beginning of World War II, John T. Whalen, and Webster E. Janssen of the Janssen Piano Co., Inc., developed this laminated-wood-frame bicycle to conserve critical materials yet provide essential transportation. Wood subsequently proved to be more critical than metal, so the bicycle was not marketed.

The fork, saddle, handle bars, and elliptical frame are of laminated wood. The wheels are of metal, with 36 tangential steel spokes, and are 24 inches in diameter, mounting 26-by-1.375-inch Goodyear tires and tubes.

A New Departure Model D coaster brake is incorporated in the rear-wheel hub, and the drive, by roller chain with metal sprockets and wooden pedals, is on the right side of the frame. Ball bearings are used throughout the machine.

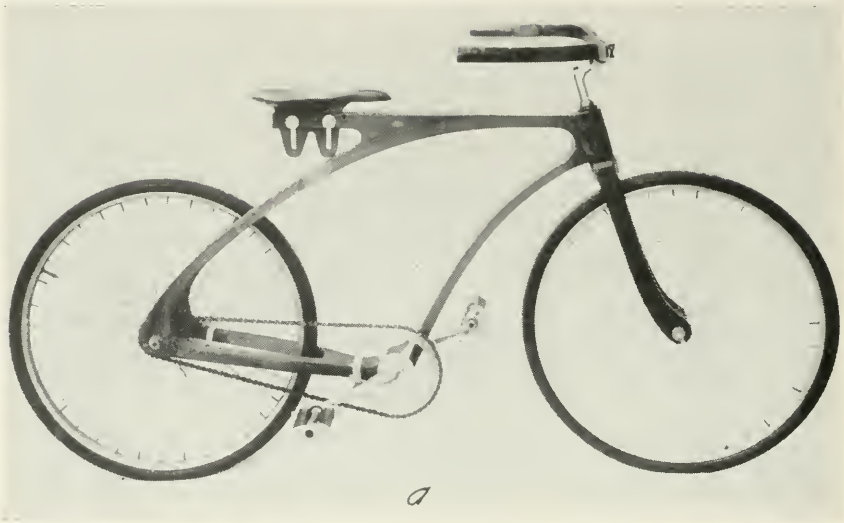
The saddle is unsprung but is adjustable. There are no mudguards or chain guard, and no grips on the handle bars. The machine's weight is approximately 31 pounds.

RALEIGH BICYCLE, Ca. 1949

U. S. N. M. No. 313481; original; gift of Alvaro Zabala in 1950; photograph No. 41168; plate 24, *b*.

On January 3, 1950, Alvaro Zabala left Bogotá, Colombia, on this bicycle, and headed for New York City. After pedaling through

a, Snyder bicycle, 1927.
b, Reinhardt bicycle, 1935.



a, Whalen and Janssen laminated-wood-frame bicycle, 1942.
b, Raleigh bicycle, ca. 1949.

Colombia, Panamá, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, México, the Mississippi Valley, and Ontario, Canada, he reached New York City on June 2, five months later. It is estimated that about 8,000 miles were covered during the trip. Subsequently, Mr. Zabala pedaled the bicycle to Washington, where the machine was presented by him to the National Museum.

The Raleigh bicycle, made in Nottingham, England, is a well-known machine. The lightweight, tubular frame of this example is of the modern diamond type and is supported on two Dunlop metal-rimmed wheels, with 32 tangentially laced steel spokes in the front wheel and 40 in the rear. Each wheel runs on a pair of ball bearings, an oil hole being provided in each hub for lubrication. Large wing nuts are provided on each wheel axle to facilitate the removal of the wheels. The tires, 26 by 1¼ inches in size, are equipped with inner tubes.

The fork, also of lightweight tubular construction, is mounted on a pair of ball bearings, while the curved handle bars are made of tubular aluminum and are provided with rubber grips.

The sprockets and Perry roller chain are on the right side of the frame. The 46-tooth driving sprocket is mounted on a 3-piece crank assembly supported in two ball bearings in the crank hanger. An oil hole in the crank hanger is for lubrication of these bearings. The 6½-inch crank arms are detachable from the center section of the crank assembly, but are not adjustable. A ball-bearing-mounted, all-metal pedal with a metal toe clip is fitted to each crank arm. Attached to the rear wheel is a 3-gear, compound sprocket, made by Cyclo, of Birmingham, England, containing 16, 20, and 24 teeth, respectively, in its three gear sections. The three sections turn as a unit with respect to the wheel, and contain an overrunning clutch between the hub of the unit and the hub of the wheel so as to permit coasting. In use, the chain is engaged with one of the three gear sections, depending on the terrain to be covered. Changing is accomplished by loosening the wing nuts of the rear axle, placing the chain over the gear section desired, adjusting the chain tension by moving the wheel and axle within slots provided at the rear of the frame, and tightening the wing nuts. Another 16-tooth gear is rigidly attached to the other side of the wheel. By removing the wheel and turning it around in the frame, this gear, which allows no coasting, can be used.

Front and rear brakes are provided, and each consists of a pair of rubber-faced, metal shoes which clamp against the metal rim of its wheel. Each pair of shoes is controlled by a cable and hand lever attached to the handle bars, the right lever for the front wheel, and

the left lever for the rear wheel. A heavy wire spring keeps each pair of shoes normally away from the rim.

Lighting equipment consists of a tail light, a Lucifer "Aero B1" front lamp with two bulbs and a built-in switch to select the bulb that is to be used, and a Lucifer "Baby 700" generator. The generator, which operates only when the end of its armature is allowed to contact the side of the revolving front tire, is clamped to the left side of the front fork. Both of the Lucifer items were made in Switzerland.

A Brooks B–17 Champion Narrow saddle, made of heavy leather on a wire framework, is attached to a tubular aluminum post adjustable for height. The saddle is fully adjustable.

There are no mudguards on the machine. A removable aluminum tire pump bearing the name "Britannialloy" is secured to the lower tube of the frame. Carried on the handle bars are a pair of aluminum water flasks and a tool bag. Small flags of the 10 countries through which Mr. Zabala travelled are draped from the handle bars to the saddle. The complete machine as exhibited weighs approximately 33 pounds.

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